

Introductory Lecture
for 1815

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James Rush M.D.

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Lecture for 1815

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COMMUNITER BONA PROFUNDERE DEORUM EST.

I have come before you to deliver an
introduction to the lectures of the Late
Dr. Benjamin Rush on the Institute and Practice
of Medicine, In thus addressing you I do not
feel as if I were performing a voluntary task.
It is a duty. By the favor of the author of these
lectures I have been made the possessor of them,
and I should be unworthy of the trust, if I
were not by an endeavour to extend the truths
they contain, to aim at some slender imita-
tion of the exertion of him who used so much
industry to originate and teach them. The
present time has been call'd with a sentiment
of reproach the age of lectures, In thus adding
to the number, I feel disposed to question the
advantages that are said to result from
them made of instruction and to ask if
greater benefits might not be derived from
the more deliberate opportunity which books

When a body floats in water it affects
a particular position, and this position
is such, that the line which joins the centre
of gravity of the body and the centre of
gravity of the immersed part is always
vertical. —

By Hukinson a thin Man was taken
five feet two inches

afford for receiving knowledge and reflecting
upon it, than can take place in the hasty trans-
actions of oral discourse. - The business of pub-
lic lectures is like the other practices of the world
into which abuses have crept by the interest of
men and the oversight of time. Their advantage
was real and indispensable to the student
at their institution. They had their origin with
teachers who had knowledge to communicate
and who had not the multiplied means of
the press to extend that knowledge to other
times and places. Printing has changed the
mode of many acts and books have now
become the common and sufficient instructors
of the world. To this remark there are some
exceptions. The elements of all knowledge
must be addressed to the senses, and in
medical study there are some branches
so absolutely elementary that an attempt
to teach them in any other way than by

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exhibiting their objects to the senses. would be³
all in vain. Such branches are Anatomy
The experiments of Chemistry, The operation
of Surgery and Materia Medica where it is
properly or usefully taught by showing
and not merely describing the sensible qua-
lities of Medicines. These subjects will be
more easily understood and more im-
pressively marked by the demonstrations of
a lecturer. An other occasion on which lec-
tures may be useful is when they contain
knowledge or peculiar opinions which can-
not be obtained from any other source.
I need scarcely say with what plea I
claim your attention. The lectures you will
hear contain not only the record of as
much experience as has fallen to the lot
of any teacher, but they contain original
deductions from this experience and an

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application of principles thus reduced to the
purposes of medical practice. That you
may know the opinions contained in these
lectures are original and useful, I have
only to state that the trial and conviction
of their truth throughout a whole country
has overcome as powerful an opposition
as was ever raised against any innovation
and that with the double operation which
many truths have of offending and convin-
cing, they have by the same persons been
both condemned and practiced.

I have said the object of the lectures I
will read to you is to teach the Institutes
and practice of medicine. The systematic
division that has been made of these two
great branches of medical study is as follows
The Institutes have been separated into
Physiology which treats of all the actions

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of the body in a healthy state: Hygiene which⁵
lays down the rules for preserving these health
actions: Pathology which describes the actions
of the body in a diseased state, and Thera
peutics which points out in a general way
the qualities of medicines for the cure of this
diseased state. The Practice of Medicine en
ters into the detail of all the general rules
laid down in Pathology and Therapeutics.
The separation of Institutes and Practice of
Medicine, is no more than that division
which every science admits into a theo
retical and practical part. - Physiology
or the first ^{branch} part of the Institutes, among other
actions of a healthy body, treats of the form
and uses of the muscles and points out the
mode of their operation in the exercises of
walking running sailing and Swimming
and I have chosen for this introductory

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lecture to enter into the details of the physical
action of the exercise of Swimming

Man is almost the only animal that
cannot swim naturally, and he is almost
the only animal which by his art, can over-
come those necessities to which his structure
seems to limit him. It becomes then a
subject of philosophical enquiry, why man
cannot swim naturally and by what ma-
nagement of his body he can remedy his na-
tural incapacity. The whole art of swimming
depends upon the body being of less specific
gravity than water, and upon the proper po-
sition and muscular exertion of that body.
And first of the buoyancy necessary for swimming.
The human body is in general so much lighter
than an equal bulk of water that it will
remain suspended at the surface when motion

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sed in it. This difference of gravity well is
a peculiar essential to the art of swimming, If
we consider that when animals move in
fluids lighter than their bodies, there is a two
fold exertion necessary one to give them a pro-
gressive motion thro' the other to prevent their
sinking. Birds move thro' the air which is much
lighter than their bodies by means of this two fold
action of suspension and progression, and the
great mass of flesh on the breast of these animals
shows the strong muscular power applied to
the wings for the laborious exercise of flying.
But man has proportionally to birds very little
strength, enough indeed to move him slowly
thro' the water when he is supported by its greater
weight, but far short of that vast power which
would be necessary for his support and pro-
gression if the water were much lighter than his



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body. If the muscular power of man were
much increased beyond its present limit - then
the weight of the body might be greater than
water, for this additional strength would sup-
port ~~the body~~ ^{it} in the lighter fluid, and swimming
would then be effected upon the principles of
the art of Flying. - In order that man may
swim then his body should be somewhat lighter
than an equal bulk of water, that it may
be supported at the surface, and the experi-
ence of divers proves that it is so. They cannot
descend to great depths ~~except they~~ without in-
creasing their weight by some heavy body, or
by giving themselves a powerful impetus by
a fall from a height, or by strong exertion
in swimming downwards, nor can they remain
beneath except they ~~seize~~ grab stones or
rocks or something permanent to retain
them. - But this subject of the specific gravity

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of human bodies has been exhibited with 9 more precise detail by Mr. Robertson in the Fifth volume of the Phil. Transactions. He employed a cistern six feet and a half in length; thirty inches wide and thirty inches deep. He noted the weight of the man; the height of the water in the cistern before immersion; ^{and} the height the water rose to after immersion, he then calculated the weight of the water which thus rose upon the immersion and the bulk of this being exactly equal to the bulk of the body, its weight when compared with the weight of the body gave the relative gravities of the body and water. - From a tabular view ~~which~~ he has given of all these particulars in the cases of ten men whom he subjected to his experiment, it appears that one was one pound heavier than an equal bulk of displaced water and consequently sunk. Two were of equal gravity with their respective bulks of displaced water and therefore

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would remain immersed at any point in 10
it, one was fourteen pounds lighter, and would rise
one was, eighteen pounds lighter -
one was twenty four.

one - twenty five

two - thirty and

one - thirty two pounds lighter than their

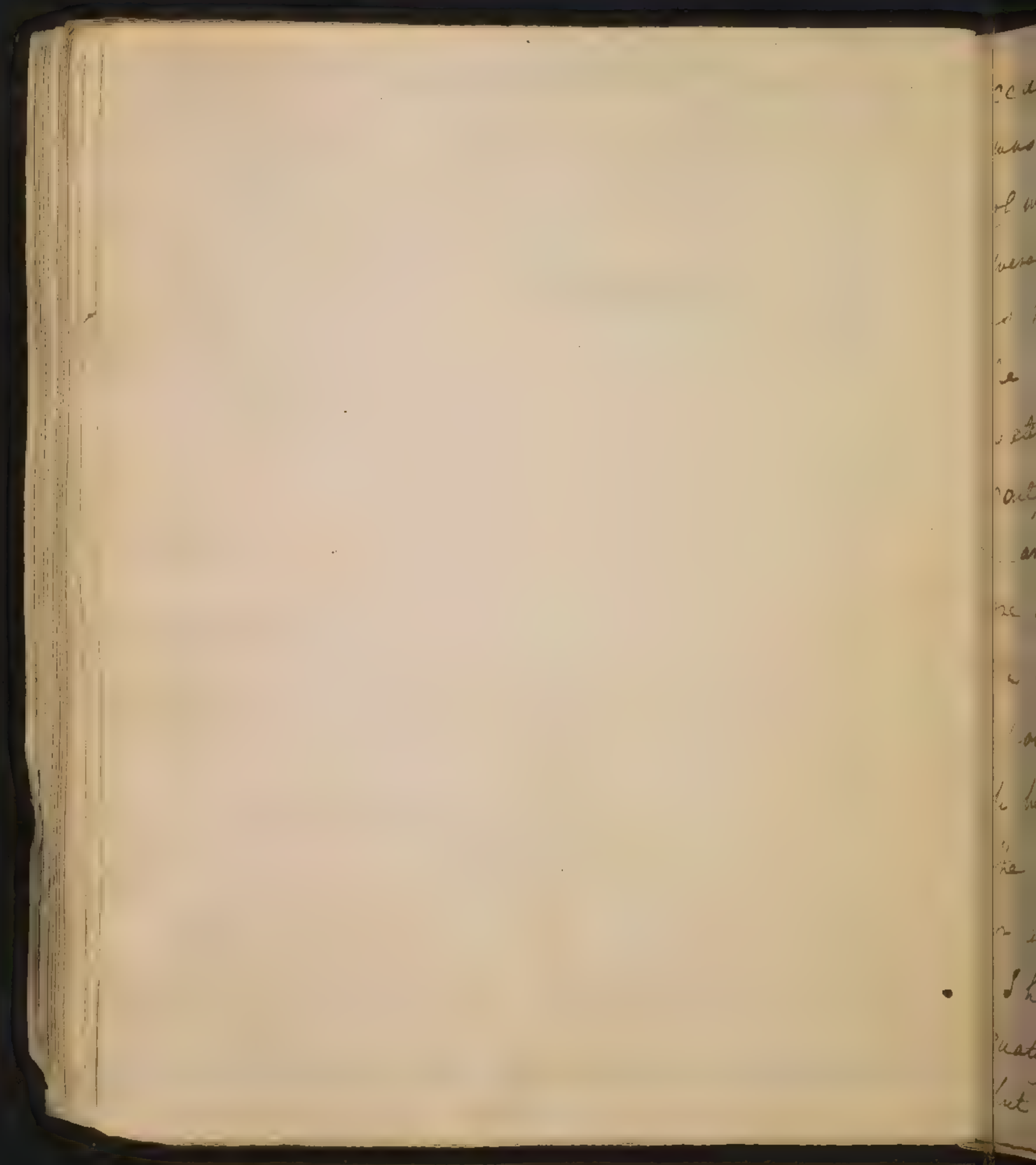
respective bulks of displaced water. - It appears
from these experiments that the specific gravities
of men bear no regular proportion to their heights.
For of two of the subjects, each of whom was
five feet four inches in height, one was twenty
and the other thirty pounds lighter than the wa-
ter. - It appears also that their specific gravities
bear no regular proportion to their bulk, for of
two of the subjects, each of whom displaced the
same quantity of water consequently having the
same bulk, one was of the same weight as
the displaced water and the other twenty
four pounds lighter. - As the specific gravity

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of a man then does not depend upon the 11
height or bulk of his whole body, the cause of
the variation must be looked for in the relative
size of the different parts of it, for these parts have
different specific gravities. The head is the greatest
and much superior to water, the gravity of the
limbs is less than the head but greater than wa-
ter, the body is about the same as water, and
the chest is the lightest part, now the chest is so
much lighter than water as to counterbalance
the greater gravity of the head and limbs, so
that the whole body when immersed is lighter
~~than the water~~. - There is a common notion
that fat men are lighter in the water than
those of a spare or slender form. Analogy would
lead us to believe it, but I have met with
no accurate observations or experiments that
make it certain. This view of the relative
gravity of the parts of the body may en-
able us to judge of the buoyancy of a man

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by his form. If the limbs and head be small 12.
and the chest large or the whole body fat, he
will float easily near the surface of the water.
Recalling that I am still considering merely the
buoyancy of the body from its greater lighter
than water without any aid from muscular
exertion, it is proper to consider in what manner
its buoyancy and the difference in the weight of its se-
veral parts will cause it to float. - The centre
of gravity of the human body is in the middle
of a line drawn across the hips, and this centre
which represents the weight of the whole mass is
below the chest or lightest part, therefore when the
body is immersed ~~in the water~~ the chest will be
brought above and the hips will descend till the
body becomes erect and in this posture will
float, sinking ^{more or less} beneath the surface according
to its specific gravity. Thus returning to the pre-



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ceasing experiments, the man whose weight
was one pound more than an equal bulk
of water would sink to the bottom, those who
were lighter would remain at the surface with
as much of the body above it as is equal to
the difference of the weight of the body and the
water, and this part will always be the upper
part of the head. If we suppose the head of a
man to weigh twenty five pounds, then that
one who was twenty five pounds lighter than
the water could float with the whole head
above the surface. But such a buoyancy is rarely
to be met, and the body generally sinks till
the water rises to about the height of the eyes
or above them.

I have thus far considered the first essential
quality for swimming the buoyancy of the body.
but this alone would not enable a man to

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continue in the water. - Since the position 14
he would assume would be as we have just
seen with his mouth and nose below the sur-
face and this would prevent respiration on
which his life depends. In order then that he
might live in the water by means of his lividity
it would be necessary that he should so far
incline his head backwards that the portion
~~which~~^{which} remained above the surface might be
the nose and mouth, but the face being in this
case horizontal and the head thrown back to
nearly a right angle with the body, the posture
would be too constrained and painful to
be borne for any length of time, but supposing
this posture were no inconvenience, yet from
the slight difference in the gravity of the body
and water and from the small elevation the
face would have above the surface the slightest

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impulse such as the movement of a limb 15
or the mere stroke of a wave would be sufficient
to plunge the body so frequently and so far below
the surface as to disturb the breathing very much
and possibly to destroy it - another cause then
for the support of man in order that he may live
in the water, must be sought besides his body and
this cause will be found in the second essential
for swimming a proper muscular exertion. -

~~This involves so positions as to be in the water~~
~~for the action of the stomach.~~ This head includes
the consideration of the proper position for
swimming since this position is man-
tained only by muscular exertion. -

The position which offers greatest resistance
to the ascent of the body in water is the
horizontal one, and that of least resis-
tance the upright, for in these opposite cases
there is the largest and smallest possible sur-

✓ On the back let us suppose. -

face directly opposed to the water in its 10
passage thro it - But we have seen that the
body when immersed falls to the upright posi-
tion, the least advantageous for support.
In order therefore to bring it to the proper hori-
zontal posture the water below must be
struck by the feet, this elevates the limbs to
the surface and sets the whole body ⁱⁿ the
horizontal line. But the stroke of the feet in
this situation would not prevent the limbs
sinking again to the upright direction, the
horizontal line then must be preserved by
other means. These are a strong contraction
of the muscles of the back and hips by
which these parts are kept in a rigid
line with the chest. Now the chest being
the buoyant part of the body and floating
at the surface, the inferior parts are raised
by this rigidity to project as it were from

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the Chest as a fixed point, and thus the 17.
horizontal posture is maintained at the sur-
face. - I wish what I have here remarked
of the Back and Glutes being kept in a
rigid line with the Chest to be remembered
since I shall more than once recur to it
and I hope to show that upon this more
than upon any other point the art of
swimming depends. In treating of the hog-
ging of the back I said a man could not
live in the upright position in water, be-
cause he could ^{not} keep the head drawn back
so far that the part which remained above
the surface might be the nose and mouth.
But in the horizontal line ⁱⁿ which he is
now supposed to be, this difficulty no longer
exists, and the smallest reflection of the
head will enable him to breathe with
perfect freedom. Since then the body ~~can~~

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extended on the back along the surface 18
has most buoyancy because nearly all the
body is immersed and as the small portion
~~that~~ ^{which} remains above is the face which al-
lows respiration, it follows that the best
position for swimming would be for a man
to throw himself on the back, bring the body
straight at the surface and by striking with
the limbs to move thro' the water. But this
mode of swimming on the back tho' the
easiest to be learned if the art were taken
up synthetically, yet from the slowness of the
motion in this posture, and the violence ^{it} ~~does~~
offer to the habits of man, by his thus moving
in the opposite direction to which he looks
and his lying on the back, it is generally
the last acquired or practiced. ~~But~~ swim-
ming is always learned by turning from



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This supine to the prone position, or 19
with the breast upon the water. Now this
prone position immediately demonstrates the buoy-
ancy of the body, for ~~as before~~ ^{since} when supine
it was of the same gravity with the water, from
a small part only being above the surface and
as respiration would continue from that part
being the mouth and nose when the body is
turned to the prone position, it becomes heavier
than water, from the impossibility of breathing
in this situation without keeping the whole
head above the surface. Hence arises the
necessity of muscular exertions in swimming
on the face, to support the body, rendered heavier
by this elevation of the head.

The phenomena of swimming in this prone
position are. First the man shows himself
on the surface of the water, he reflects

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the head from its right line with the 20
body is nearly a right angle. The legs being
heavier than water would sink if he did not
contract the muscles of the back, these by having
one of their attachments to the chest or lightest
part and the other to the hips, the latter are
elevated and held at the surface, and con-
sequently the legs are kept from sinking to
their natural situation in the ~~lower~~ water.
The hands are now slowly stretched out: at
the same time the joints of the lower limbs
are slowly bent, then the hands are forced
being brought round with the palm opposite
to the water and at the same moment
the legs are violently extended. The water
yields to these impulses, but it cannot
yield as fast as they can be moved, and
this difference of velocity in the limbs and the

yielding of the water, becomes a solid ²¹
surface for the limbs to press against, and
the body moves forward with a velocity
derived from this solid resistance.

I said that in swimming on the face, with
the head and neck out of water, the
body has no lateral consequence the
movement is like flying, in which the body
besides being ~~supported~~ moved forward
must be supported, and indeed the mode
of action in swimming exactly resembles
the flight of those birds which move thro'
the air by a succession of curves. as
the wood pecker and common yellow
throat of the country. For the body lying some-
what obliquely at the surface, the legs
being a little lower than the chest, when

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The water is struck by the feet, the feet 22 is pushed forward and out of the water but being in that raised position much heavier than before, it is brought back to the water after making a curve on the surface, which curve is forming whilst the hands and legs are preparing for a new stroke, just then as the head is about to plunge beneath in this curve a new stroke is given, and thus by a succession of ^{leaps} ~~curves~~ the swimming is continued -

After this act of swimming on the breast has been acquired, an other mode of swimming on the Back is attempted tho' this as I have already said could be much more easily learned than the first -

It is done by turning the body on the back

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so that all but the face may be under water. The inferior portion of the body is ~~then~~ to be retained near the surface by the exertion of the back and then by the forcible stroke of the feet the movement is effected. The ease with which the body is supported in the supine position is manifest from the action of the legs alone being sufficient for swimming, whilst the arms may be folded or remain at rest, whereas swimming on the breast is impracticable without the exercise of the hands.

There is another mode of the body in the supine situation called Floating. In this the body rests horizontally at the surface, being supported by a moderate motion of the hands. But this support is made at the chest a part

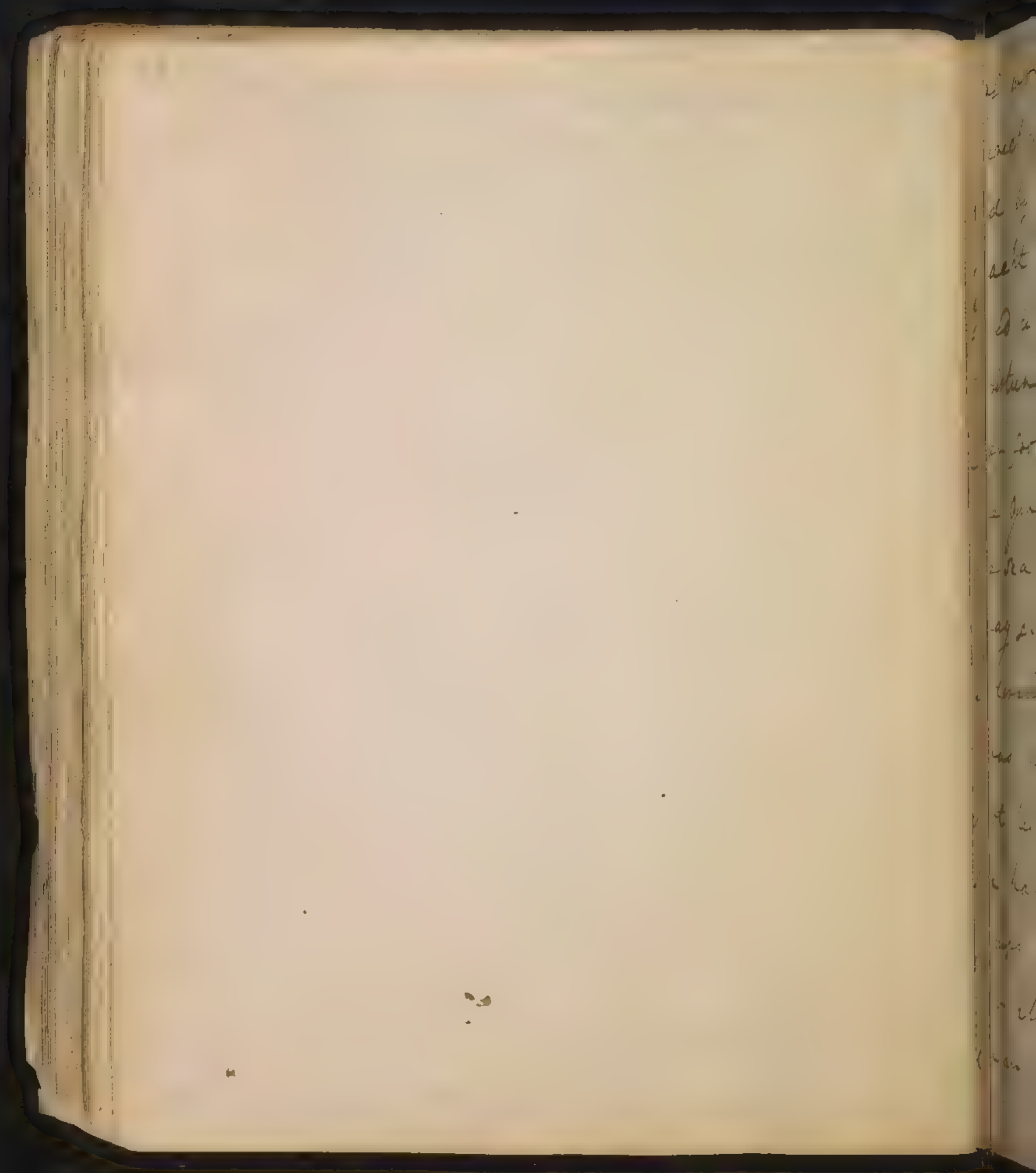
as they make no effort against the matter
for their support,

which from its buoyancy has no need of it: ²⁴
The inferior heavy portions of the body must
be upheld by preserving a support of the back
ribs and legs, that they may project by an
invisible line from the chest which remains
fixed to the surface by its buoyancy and the mo-
tion of the hands. - This tubular manage-
ment of the back I have before spoken of as
~~essential~~ to swimming on the breast. But
is the sole cause of floating. -

I have heard that persons have been able
to float without using the hands, this a
trick if possible is certainly very rare, and
must depend upon a structure not often
to be met with, If a man has a small
head, large chest slender muscles and
limbs ~~and~~ ^{or} much fat, then perhaps by
merely making that muscular rigidity re-

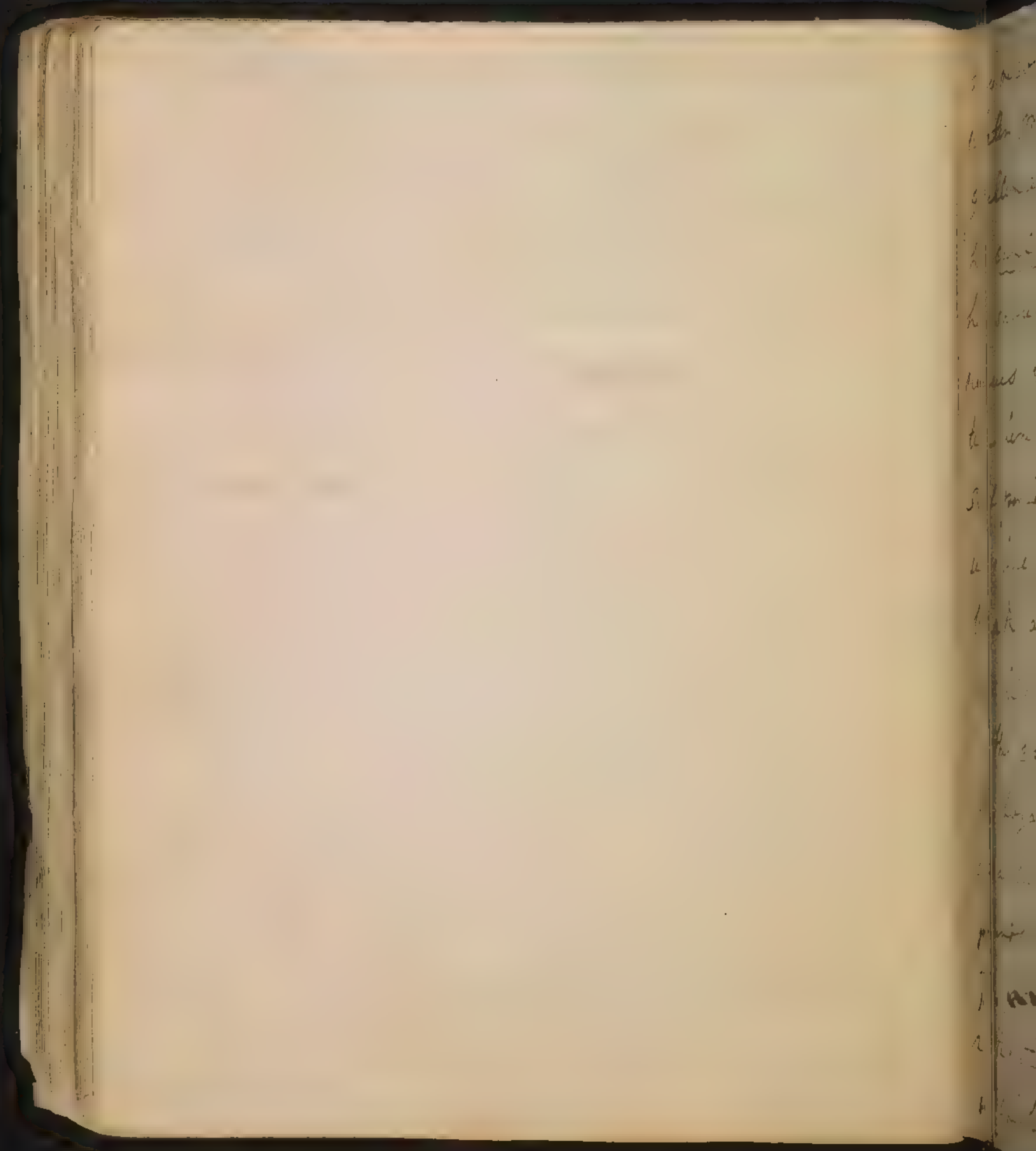
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capable to keep the body horizontally erect 25
and he might be able to stand for a short
times. I say for a short time only for it is impossible
to continue long that muscular exertion
by which the body must be kept horizontal.
There is no such thing in a healthy body as the
constant action of a muscle without a relaxation
of it, and the most violent pains arise from
an endeavour to preserve a permanency of Mus-
cular contraction - The only account of Feel-
ing without some exertion of the body, which I have
met with worthy of reliance is taken from the
Philosophical Transactions and is as follows. -
"The Lords of the Admiralty have appointed for
the exercise of the scholars belonging to the
royal academy at Portsmouth a small yacht
wherein during the summer months these
young gentlemen are taught the practice



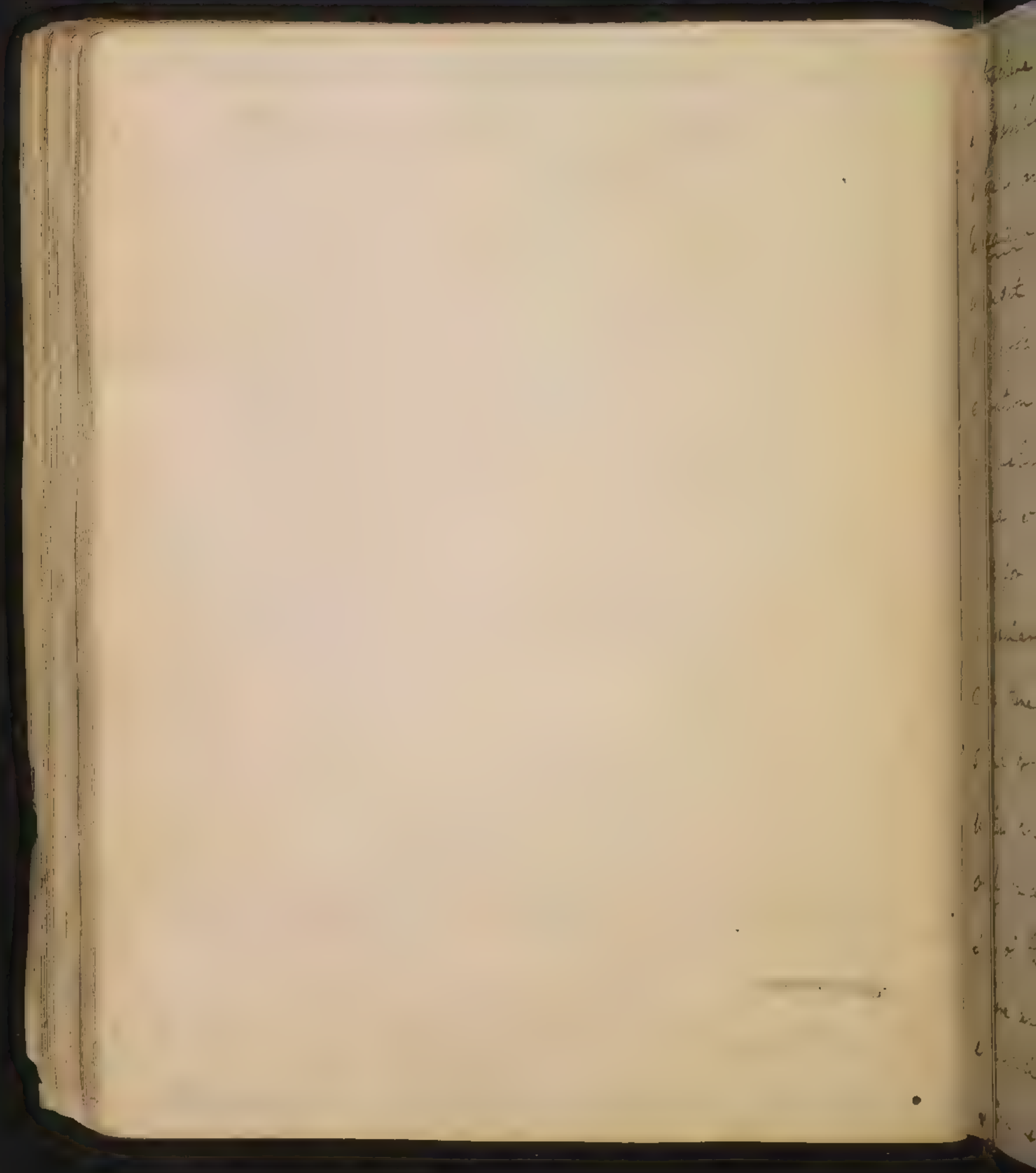
of working a vessel at sea under the direction of one of the master attendants assisted by eight or ten seamen. The last time this yacht was out one of the scholars was ordered to leave the ship. The youth was about thirteen years of ~~age~~^{old} small for his age, and far from being fat; as he was stepping on the gunwale he fell overboard. The ~~boat~~^{yacht} was in the sea was rough and the yacht had great way so that he was presently at a very considerable distance from the vessel. The shift was immediately let down, but the painter not being cast, the rope run an end and the boat went adrift. One of the seamen jumped overboard, got into the boat, brought her along side of the vessel, took in another man and then went after the youth.

-Lyon



then recovered after ~~the~~ ^{he} had been in the ²⁷
water more than half an hour. The young
gentleman relating the story said, that as
he ~~could~~ ^{swam} ~~swim~~ ^{very little} and imagining
he should sink if he strove against the
waves, he turned on his back and committ-
ed himself to their mercy. He kept him-
self perfectly calm, and trusted when a wave
was likely to break over him to hold his
breath and to shoot out the water forced
into his mouth."

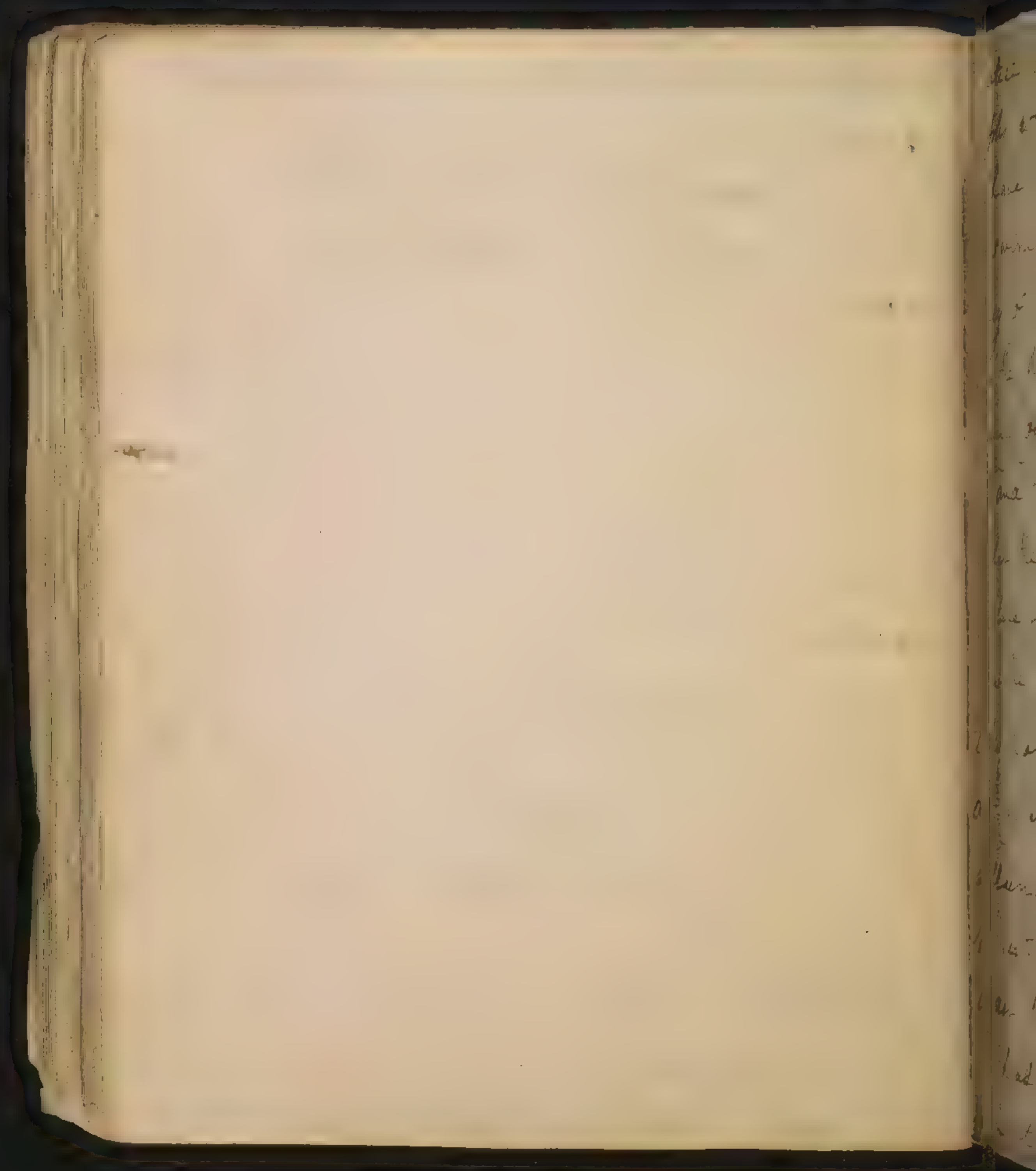
This case took place in sea water in which
the buoyancy of the body is greater than in fresh
as a cubic foot of salt water weighs 73
pounds whereas a cubic foot of fresh weighs but
70. ~~pounds~~... I have never heard from any
authority worthy of credit, of man floating
in fresh water, and without the peculiar



structure before mentioned I do not think it possible.

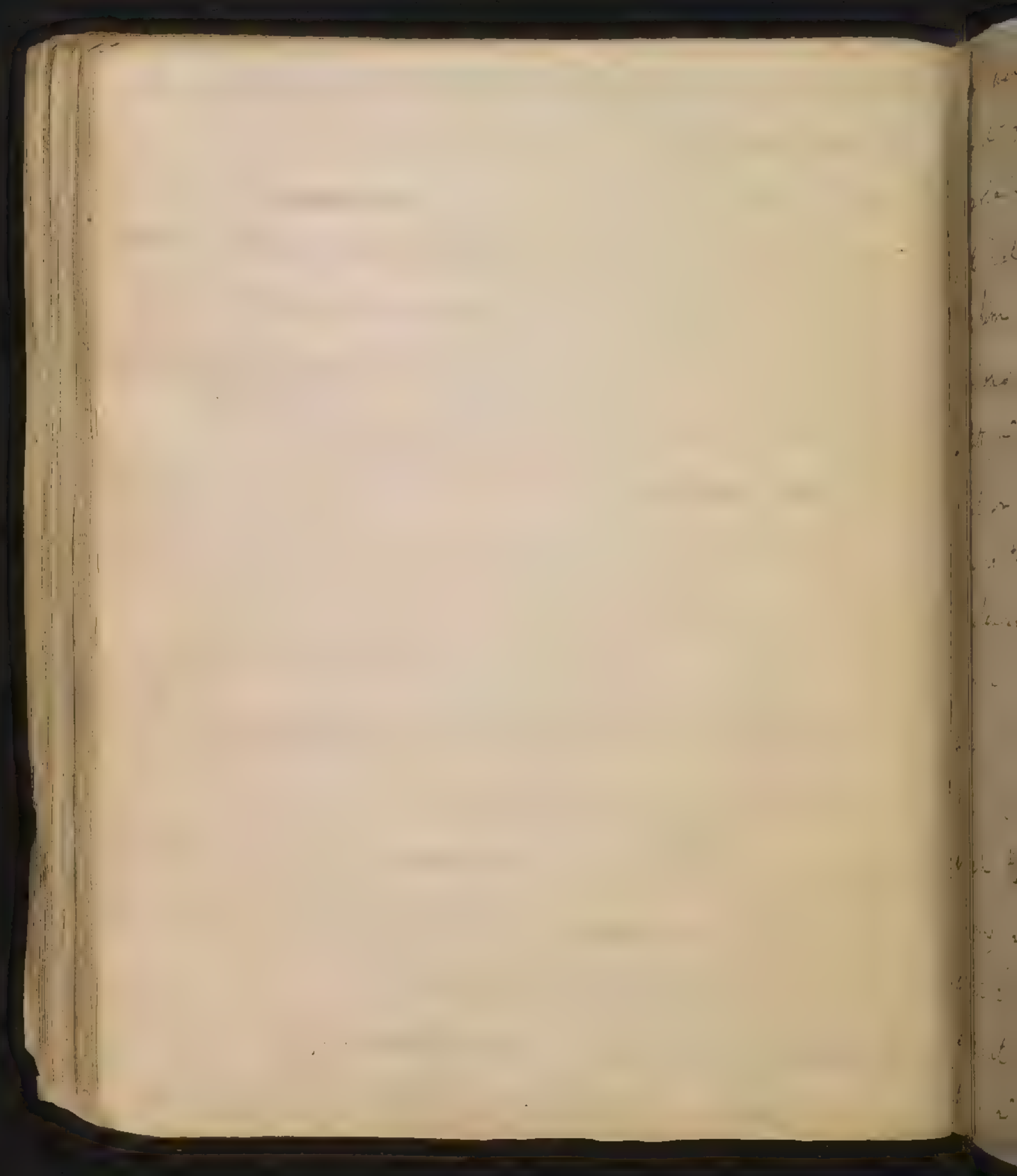
There is an operation of swimming called breasting water in which the body is kept upright with the head and shoulders above the surface. This is effected by the alternate elevation and violent stroke of the lat against the water. It is one of the most tiresome ~~most~~ modes of swimming and can be continued but for a short time, owing to the great muscular exertion necessary for it. For in this case there is a strong tendency of the body to descend from so much of it being out of the water, and the resistance to this descent is only made on the small surface of the sides of the lat.

There are some other movements in the water exhibited as feats of display by Australian swimmers. But these need no particulars.

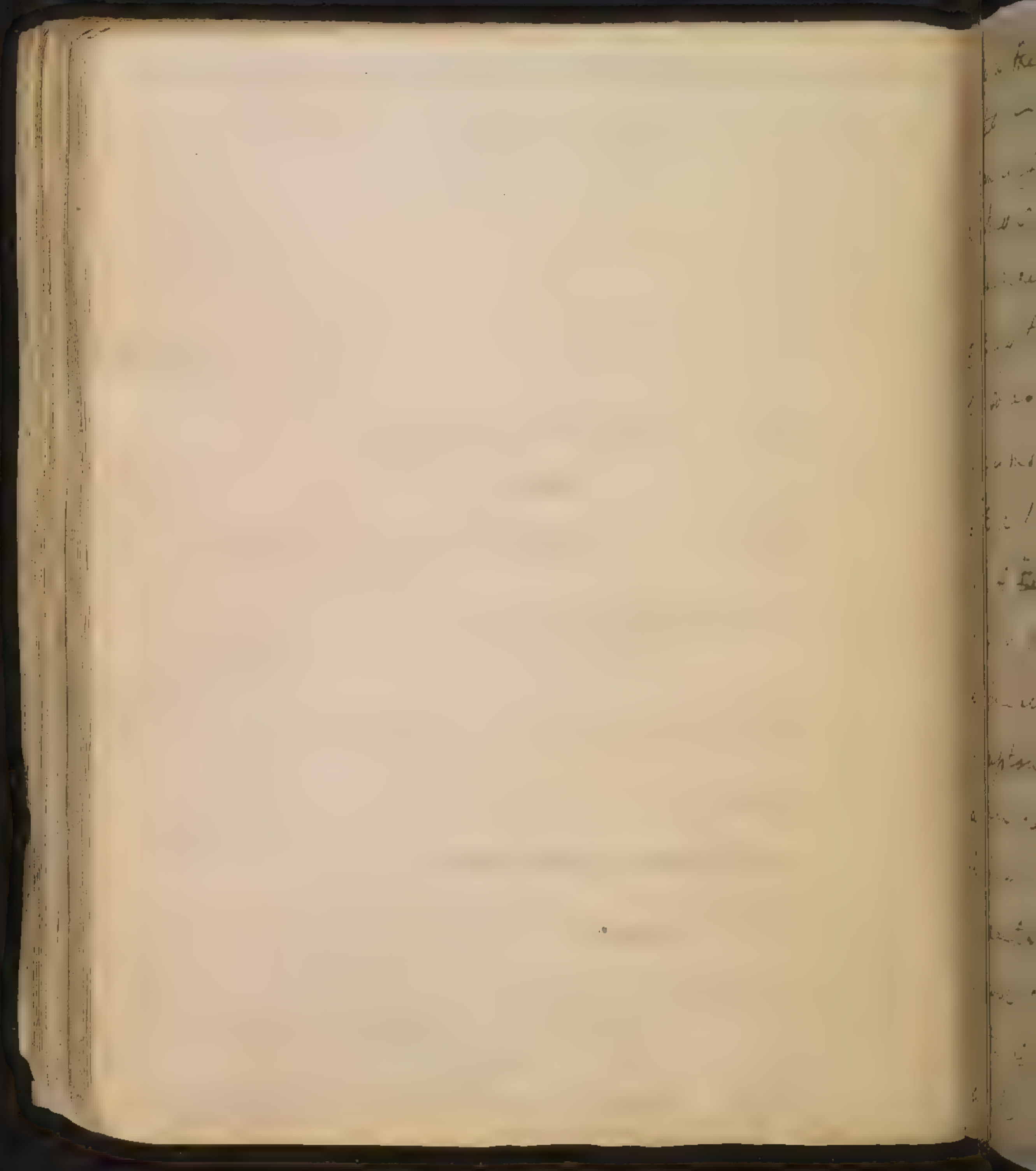


notice as they all depend on the prin 29
ciples which have been laid down. —
I have thus considered the ~~various~~ phenomena
of swimming under the two heads of the buoy-
ancy of the body and muscular exertion, un-
der the first I pointed out the relation of the
weight of the whole body and its parts to the ma-
ter and the position which this caused it to assume.
Under the last I have shown how the horizontal
balance is maintained by muscular exertion and
how the body is propelled by it. I shall now
take notice of some other particulars of the
art of swimming, which tho' they are to be
explained by the previous principles, yet could
not without a confusing digression be brought
under the preceding heads. —

It has always been a question, why man
cannot swim naturally when it is done by



nearly every brute however young the first 30
time it goes into the water. This is common-
ly explained by saying that in man fear pre-
vents that use of his limbs which would sup-
port him if he placed a confidence in his
exertions, whereas brutes swim because they are
destitute of fear. This view however will not ac-
count for it since a little attention will in-
form us that most brutes are not without this
comprehension, and some resist with violence any
attempt to be put them in the water. In short if
an explanation then it is only an instance of
that insolent philosophy and sceptic logic
which the vulgar always employ in their
assigning other causes, which fixes on any ma-
nifest antecedent circumstance, as the real
efficient cause of an effect. But the ques-
tion is of the easiest solution by attending

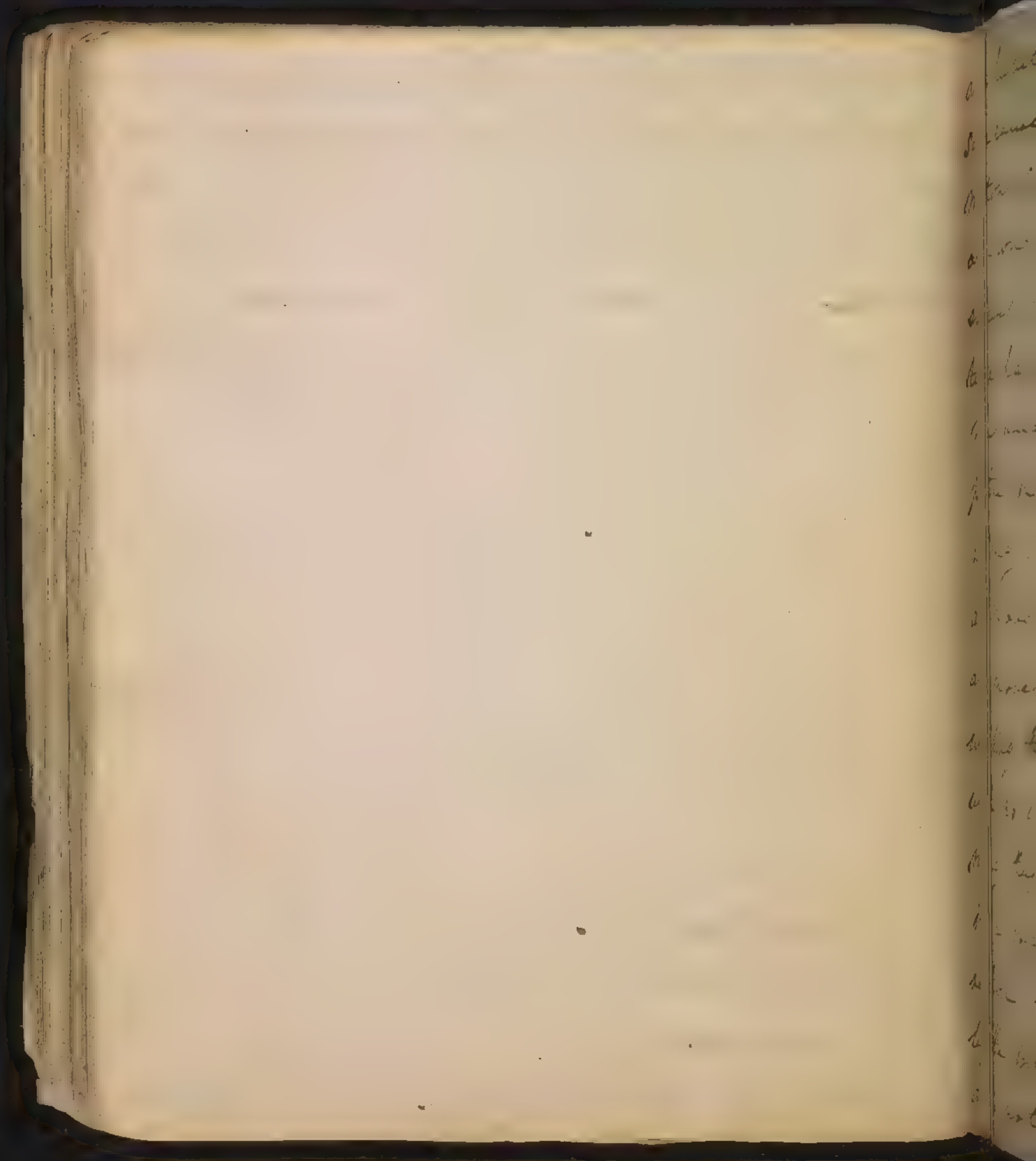


only to the different structures of Man and 31
brutes. — —

Man is formed to walk erect on a firm
level surface with the centre of his gravity
perpendicular to the base on which he moves
If at any time that perpendicularly should be
lost so as to indicate his falling forward
there is instantly an endeavour made to pre-
vent it by throwing the feet forward that the
line of ~~the~~ gravity may fall within them...
and this intention and the consequent motion
is associated by long habit with the least
sensation of a tendency to fall. Now when
a man goes into the water who cannot swim
he finds himself sinking or falling. The only
precautions he has been in the habit of using
in preventing falling is to bring his feet under the
centre of gravity at the same time to throw
out his hands to save the concussion of

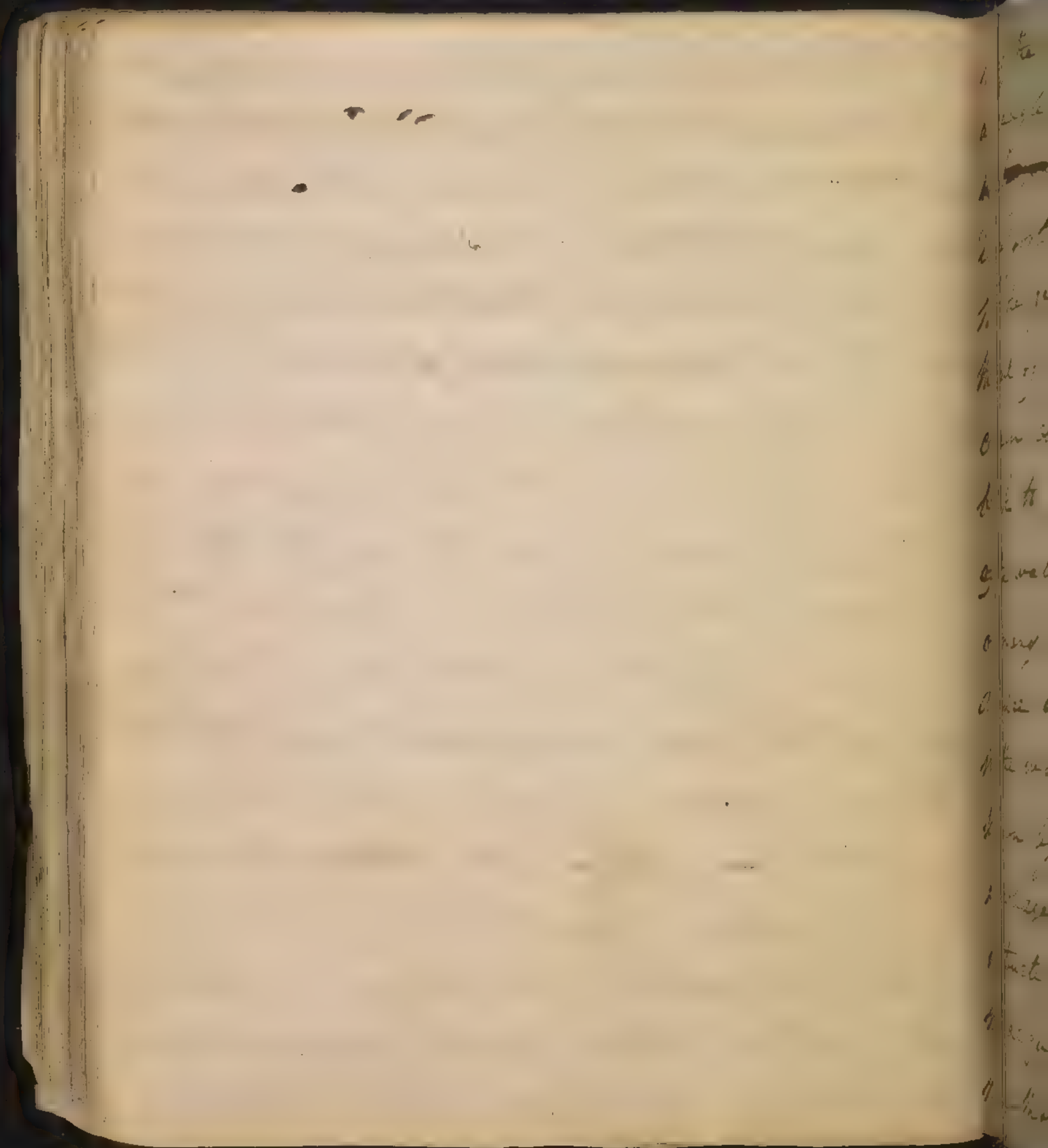


the body. This mode he at once has re 32
course to, but it is a vain endeavour for
safety, as throwing the feet forward under the
centre of gravity brings him to the upright
position, and this as we have before seen is
the least advantageous for support, in the wa-
ter. - He makes violent exertions with his feet
and this with the upright position he has now
assumed, puts him exactly in that state descri-
bed under the head of treading water and
this we know cannot be continued even by
the most expert swimmers for any length of
time. - The consequence is that he is unable
as in treading water to make ^{any} progressive
movement and becoming soon exhausted
by his exertions, he sinks beneath the surface
and is suffocated. - Such being the position
a man assumes when he goes into the water
and as this position results from his structure

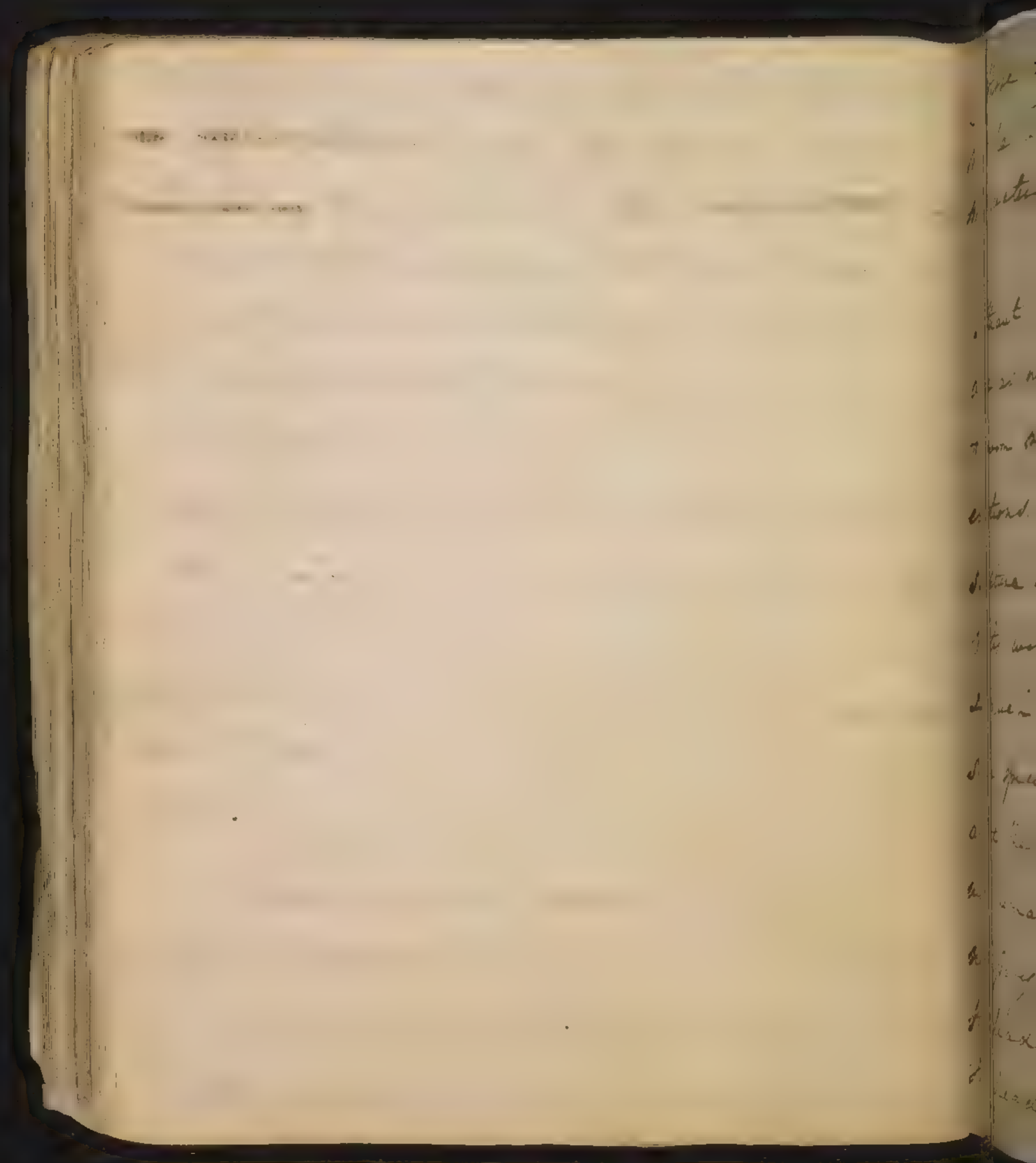


and habits, we may further see how these ³³
same causes prevent his practicing the proper
motions for swimming the first time he has
occasions for them. — For swimming requires
exercises of the body opposite in every respect
to the habitual exertions of it. —

His usual motion is made in an upright
posture, in swimming it is horizontal. In
walking or running on the earth, the legs
are moved alternately, in the water they
are moved together constituting a pair. In
walking the hands are pendent and inactive
with no exertion across the body. In swim-
ming they are moved with great labour
in a manner opposite to their former di-
rection, In walking the head is supported
by the pillar of bone of the back and neck
and not by muscular power, In swim-

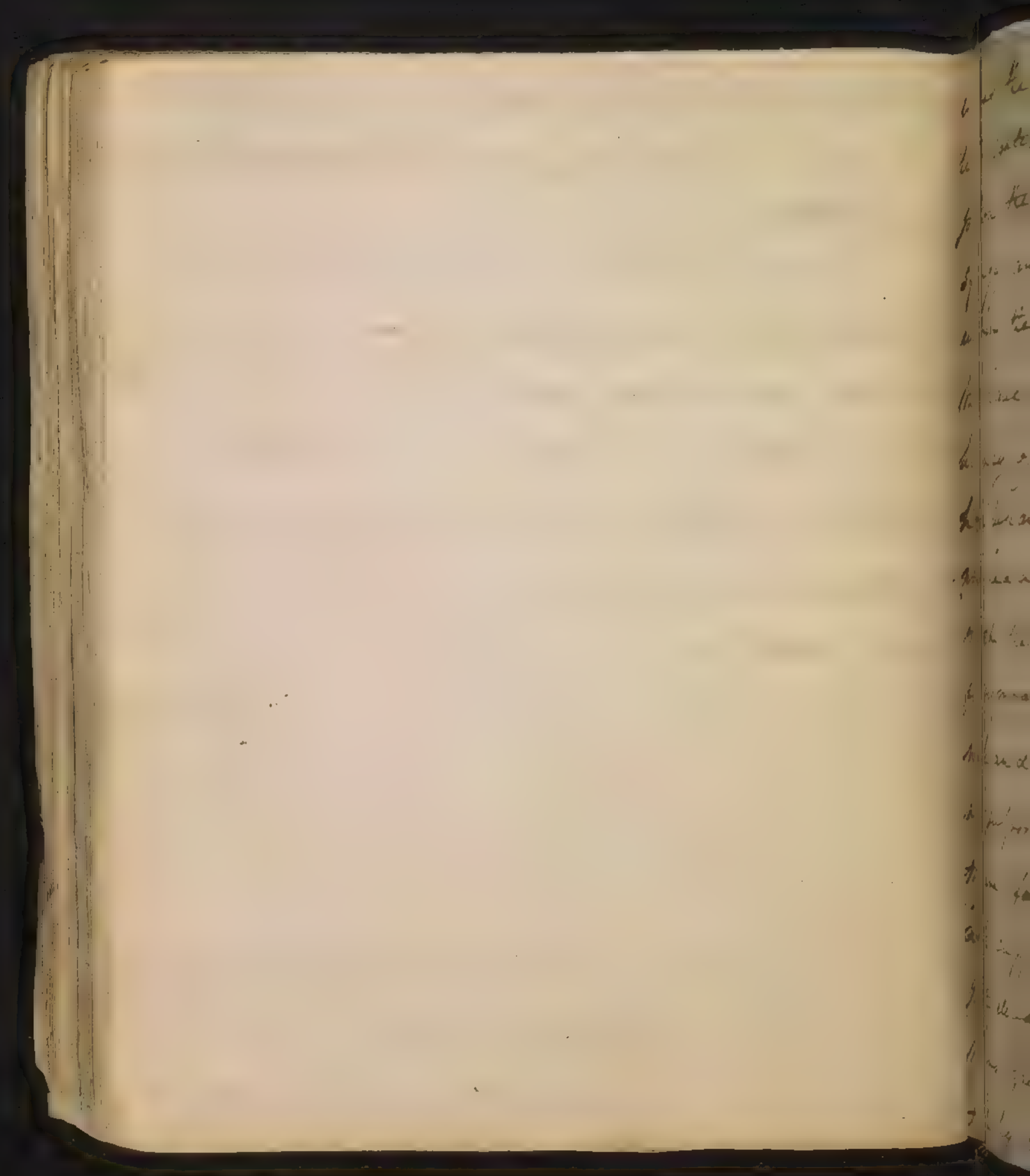


ming the head being thrown back to 34
an angle with the body, and ~~the body~~
~~is supported~~, ^{its} whole weight ~~is~~
is supported by the action of the muscles
But the great distinction and that on which
the art of swimming chiefly depends is in
certain contraction of the muscles of the
back, to retain the lips at the surface
of the water, which is not necessary for the
ordinary motion on the earth - Now this
difference between the management of the body
in the water and upon the earth, is not
known by man, and even supposing the
knowledge of it were communicated by
instruction, it might materially
the acquirement of the art of swimming
tho' without some experimental trials

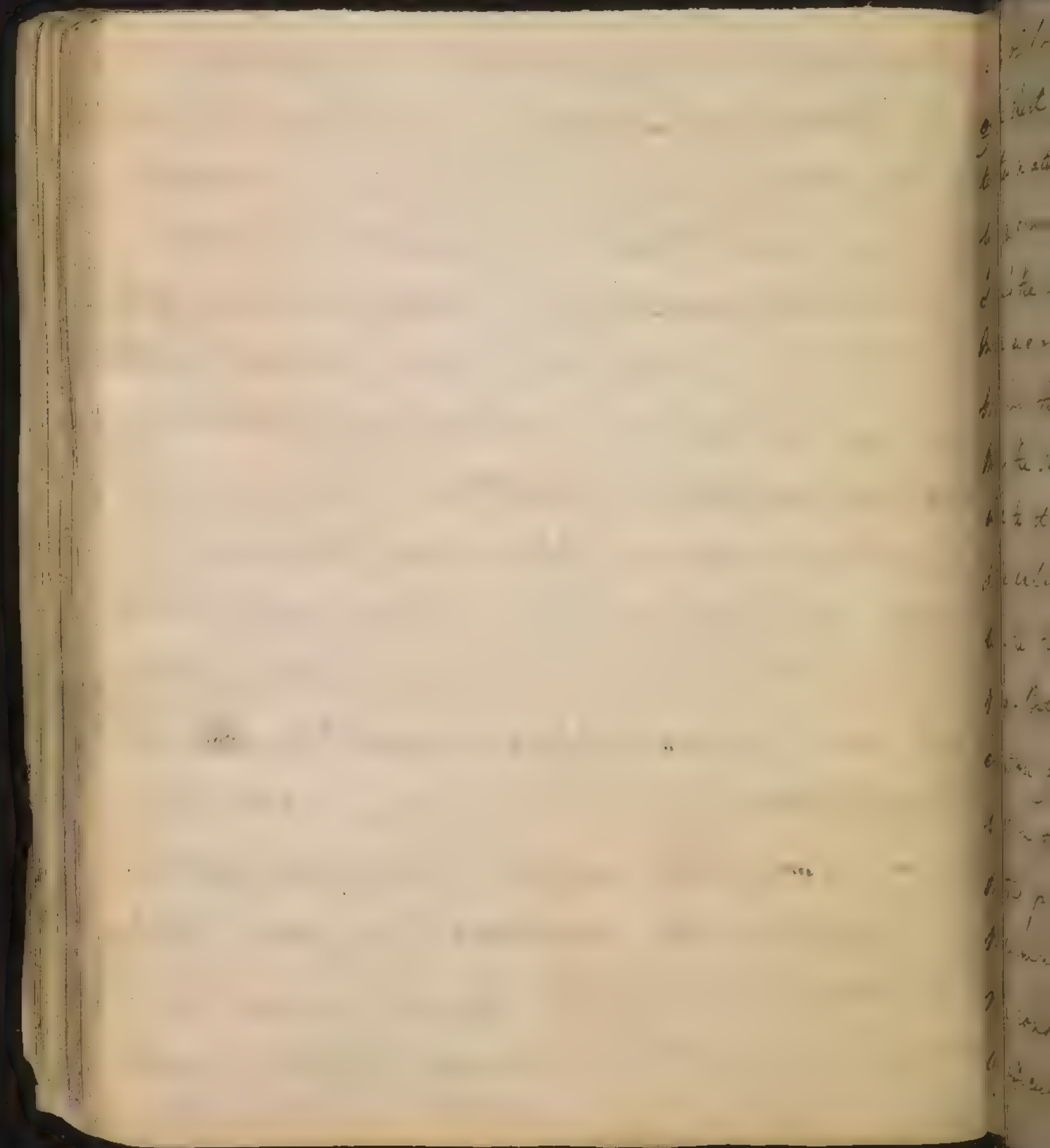


of those different motions he would 35
not be able to support himself on
the water. —

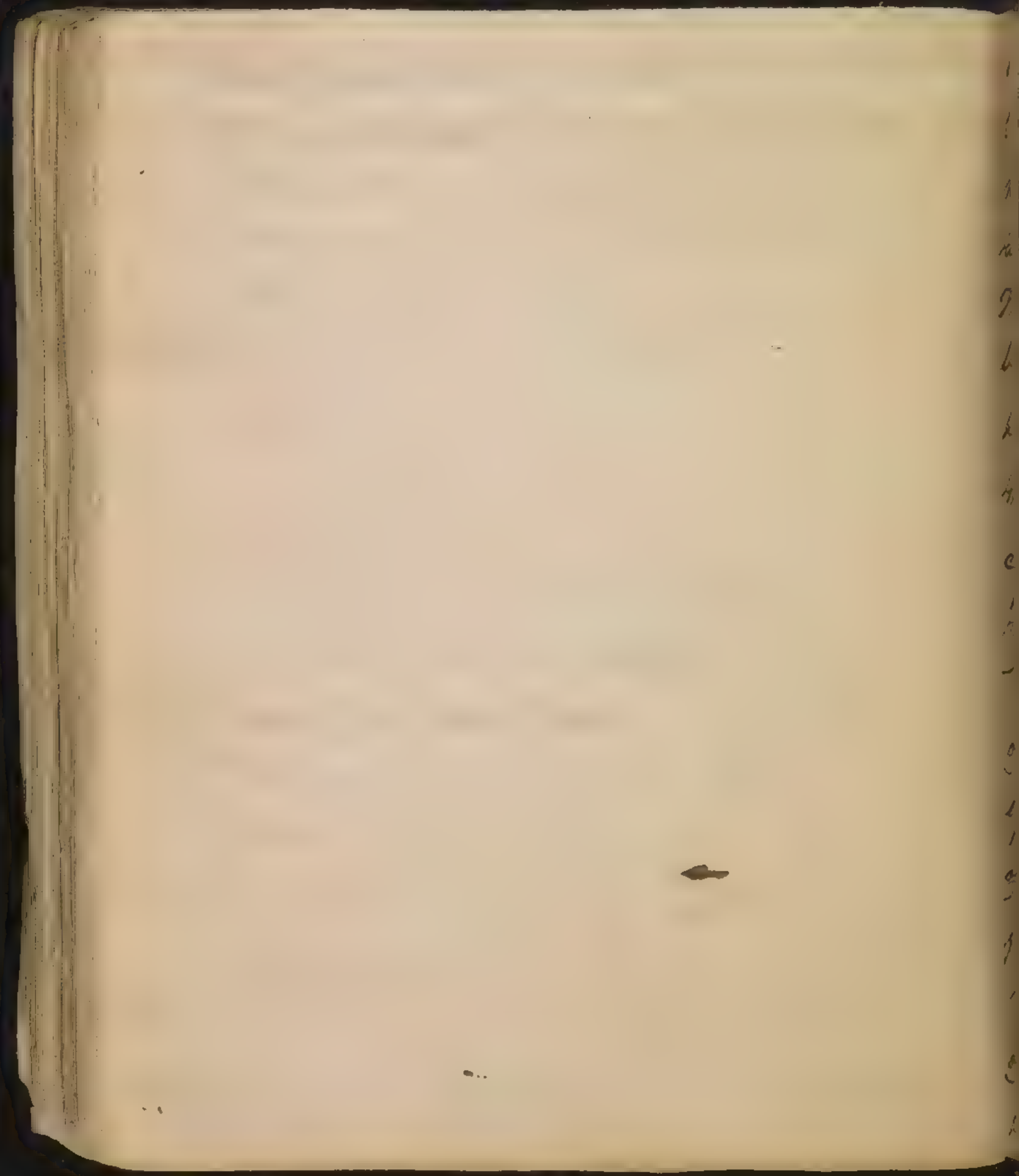
But Brute, we know swim
without this instruction and experience
and as we have seen that man is unable
to swim from his structure and ordinary
exertions, a little consideration of the
structure and ordinary exertions of
brutes, will inform us why they swim with
so much ease. — Brutes have nearly the
same specific gravity as man. Consequently
about the same relative portion of the body
will remain above the water. But it is
necessary for life that the same part in each
the head, should be above the surface.
The head is the heaviest part of man



whereas the head of butes is compara: 36
tively lighter. since there is less brain in pro-
portion, the bones of the head are more
spongy and there is a greater cavity
within the jaws and in the nostrils. Butes
then have an advantage over man in the
buoyancy of the parts of the body, but they
have besides other advantages, for the neck
and head being longer they more easily
reach the surface of the water
for respiration. The usual position of the
neck and head being horizontal, ~~the~~ and
not supported by the back bone as in man
they are furnished with a string of mus-
cle to support it without fatigue, therefore
that elevation of the head which is
man's greatest inconvenience, is not
felt by butes. — The centre of gra-

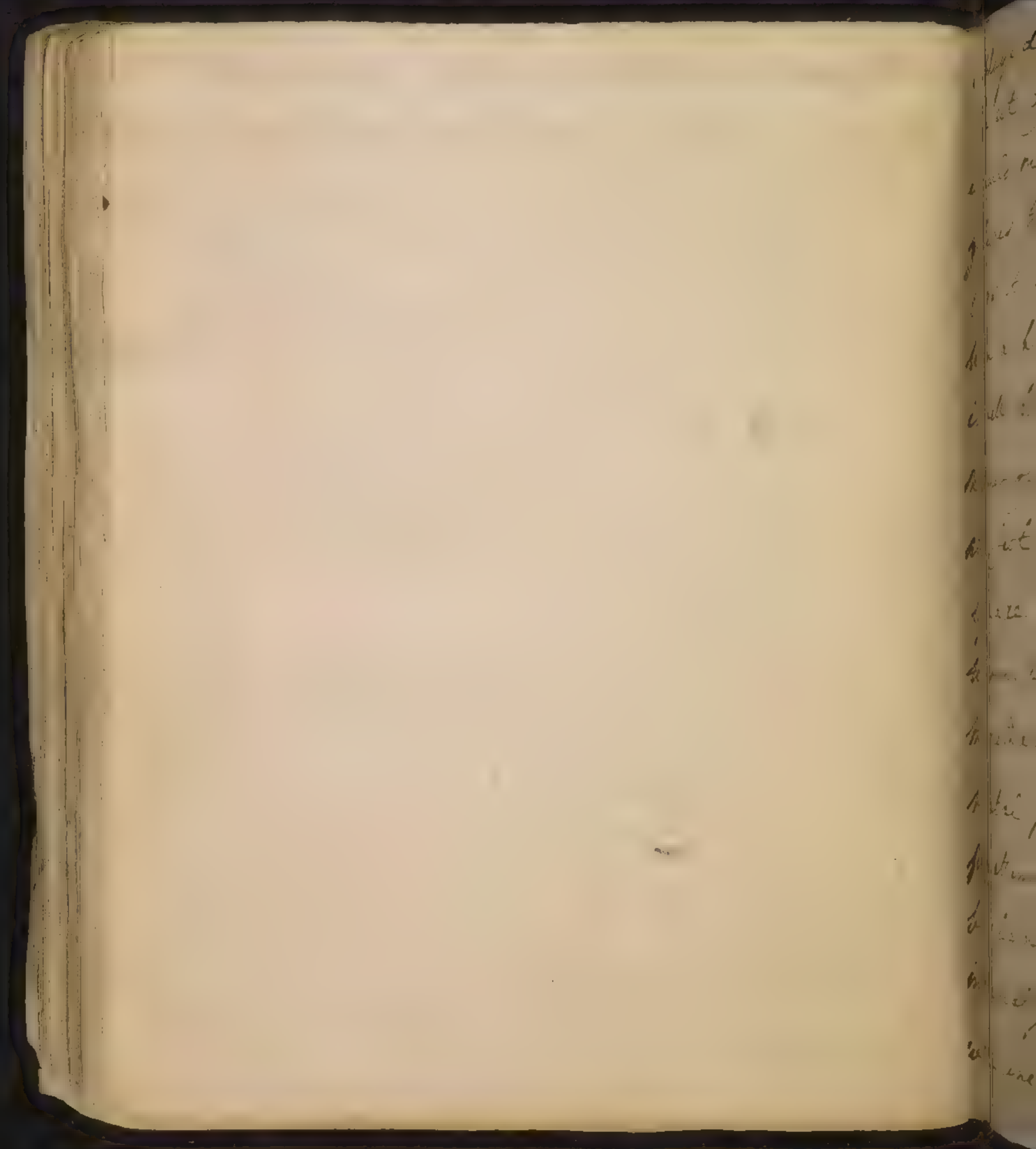


city of brutes is about the lowest part, 3rd
of the chest, so that when thrown into the wa-
ter they naturally take a position with the
legs pendant and the head upright
nearly the same as their position on the earth.
In the second point then or in position the
brute has the advantage over man, for since
this is the same in his body that he has been
used to, it is only necessary to make a
slight elevation of the head and neck to
be in the true position for progressive swim-
ming. But man must make a painful
elevation of the head and a rigid con-
traction of the back and hips. As regards
the third point or the muscular exertion for
the swimming of brutes the advantage is
more considerable, we have seen how ma-
ny difficulties man has to encounter.



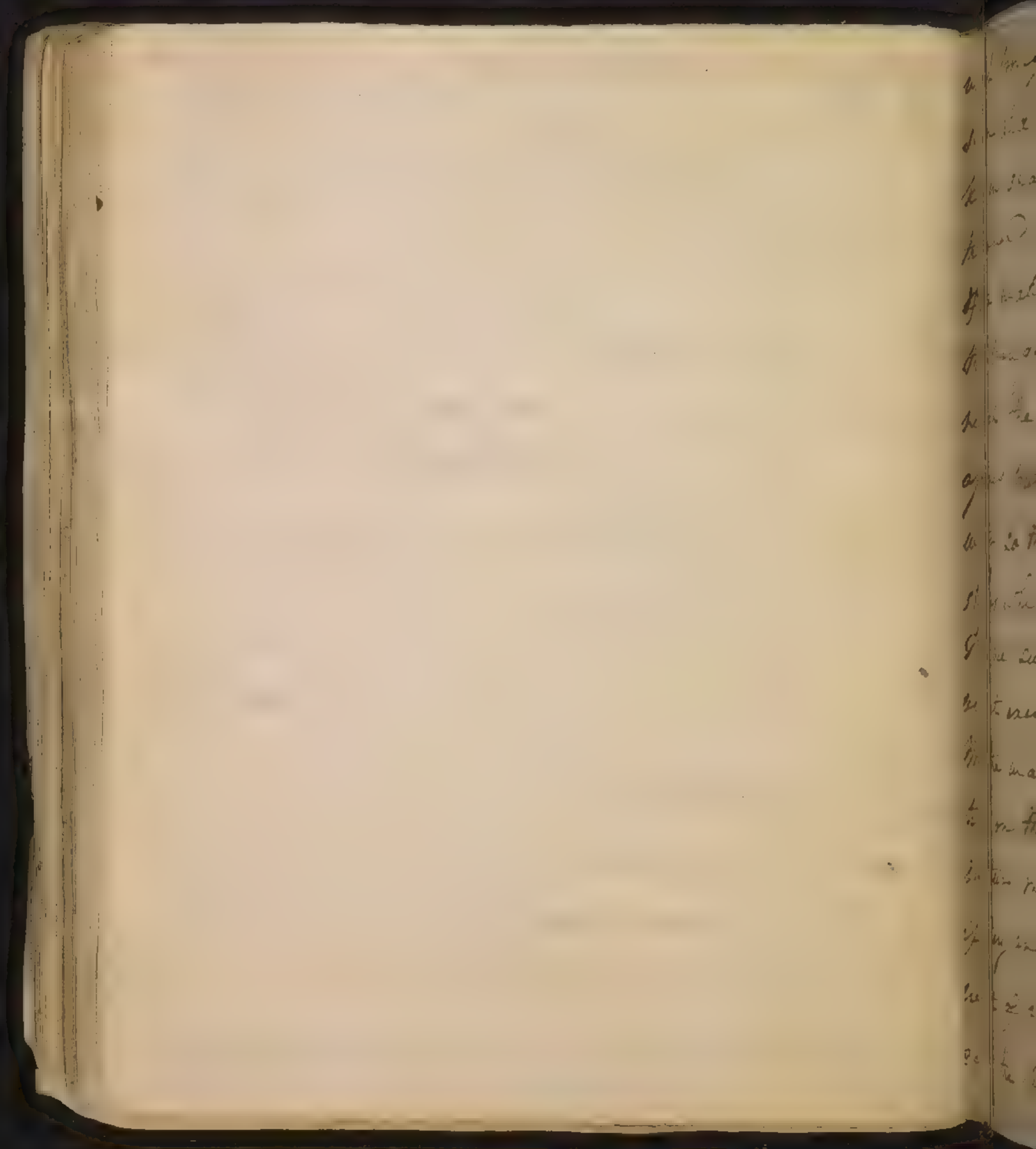
in this part of the function. But in 38
boats, the motions are all the same. That
he is habituated to on earth, he has only
to walk thro' the water to move forward.
Thus whilst men have so many things to
learn different from their usual habits; boats
have only to learn to stretch the head to
the surface of the water, and this the ne-
cessity of breathing teaches them the moment
they fall into it.

I have said that a knowledge of the theory
of swimming or the means by which it is
effected would facilitate the acquirement
of the art, but ~~but~~ ^{this} alone would not be suf-
ficient without the experience of trial in
the water. This suggests to us the consideration
of the mode in which the art is acqui-
red and the means that are occasionally

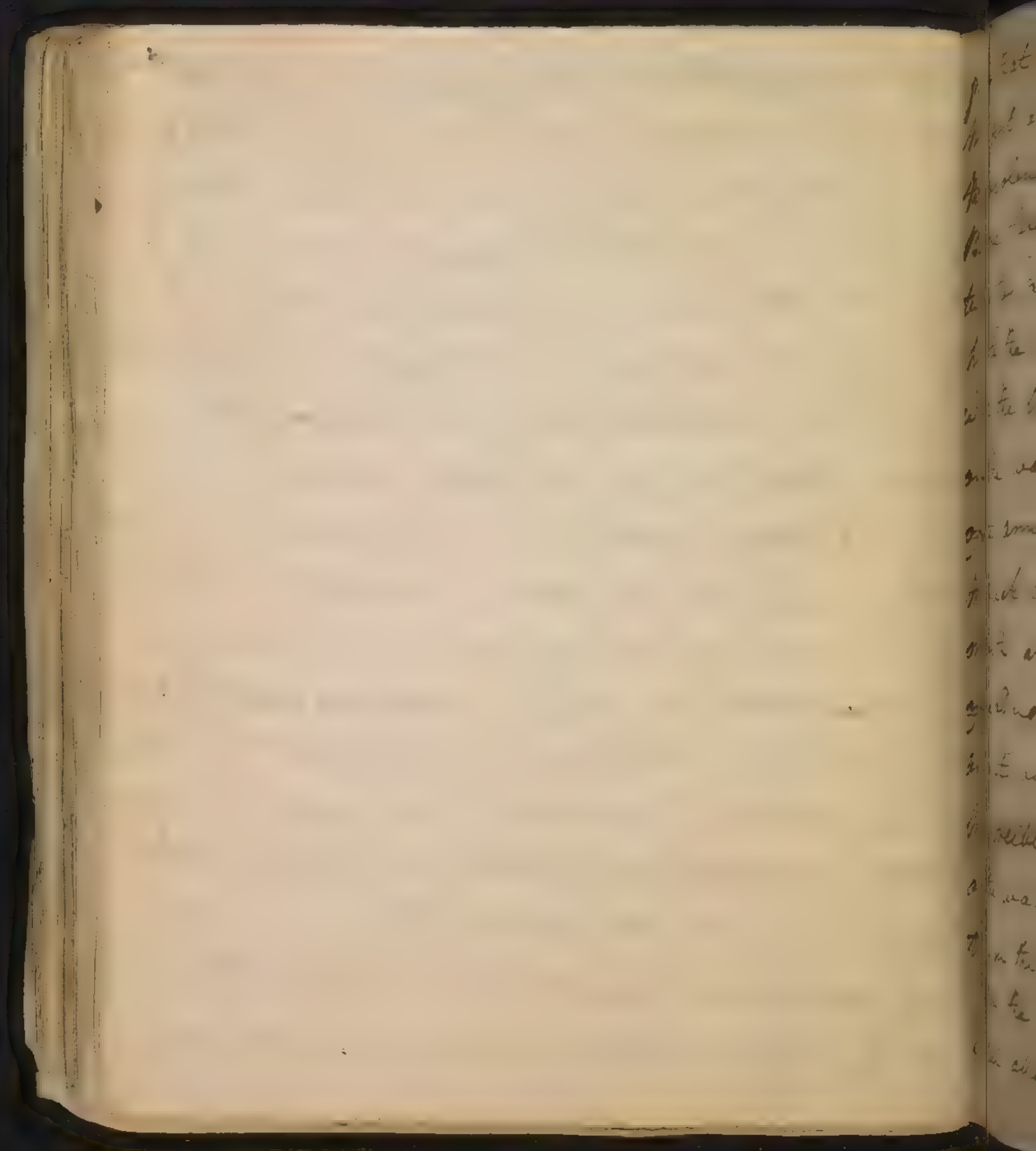


employed to teach it. ~ 39.

The art of swimming like all other art,
is learned in the tedious school of many
failures, till each successive endeavour
brings it nearer the perfect execution.
When a boy's feet go into the water, he
is well aware from seeing others, of the
manner of making the stroke with the hands
and feet, but this stroke however regular
ly made will, ^{not} support him or enable him
to swim, whilst he remains ignorant of
the method of bringing his body to the pro-
per vertical position. Any one who remembers his
first attempts at swimming, or has seen other
boys learn must have observed that they
immediately catch with their feet at the
water beneath the body or centre of gravity

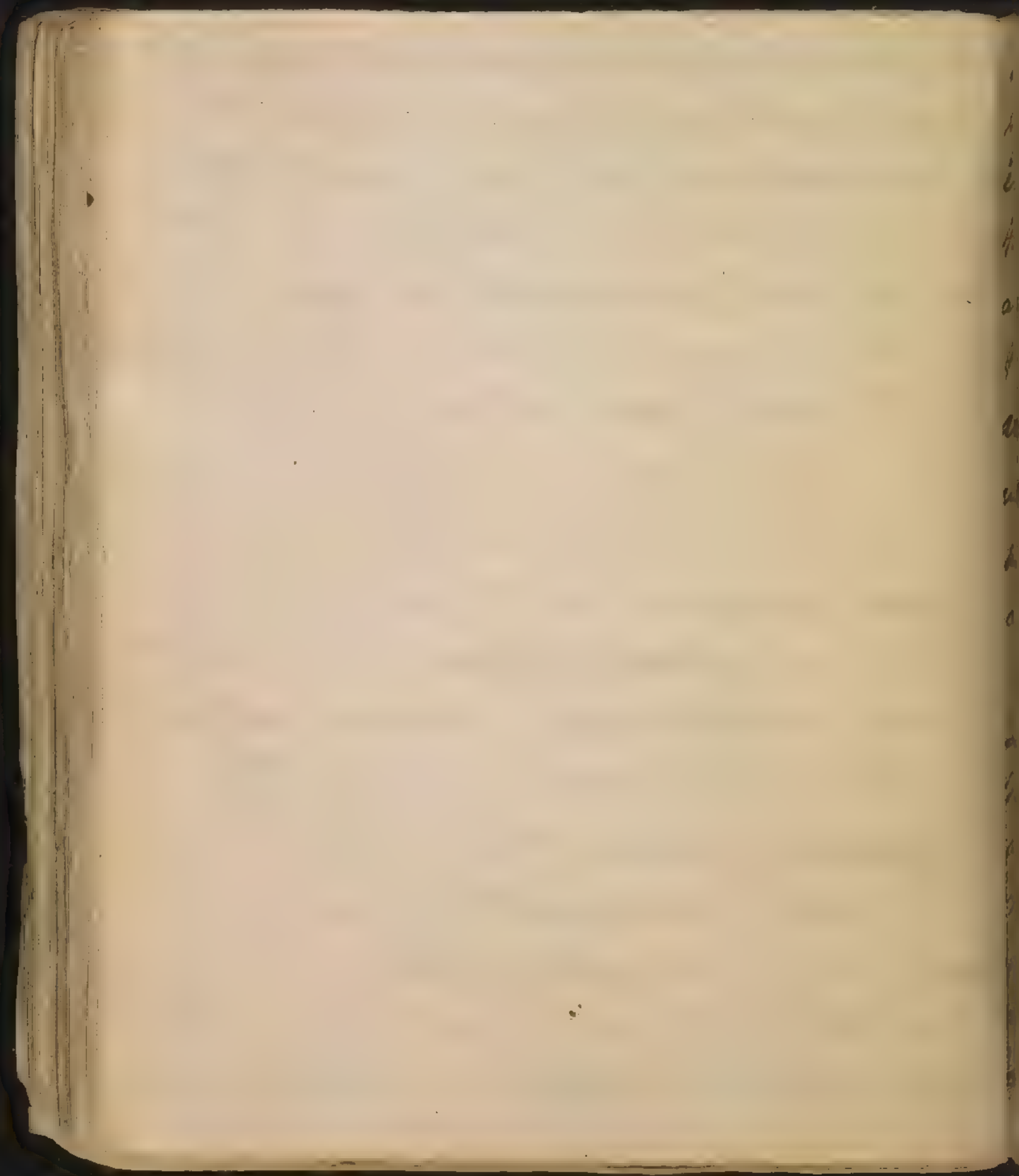


which brings them to the upright po- 40-
sition, and as the art is always under-
taken in shallow water, the feet soon touch
the ground and the attempt is at an end.
If the water be so deep that the feet when
thus brought under the body cannot
reach the bottom, the upright position it
assumes puts it into the state of treading
water, so that after the few rapid and violent
strokes which this posture requires, it sinks -
Thus we see boys learning to swim make very
violent exertions and yet make no progress
in the water. - They are generally told as instruc-
tion on these occasions to be more moderate
in their motions, and that they will do better
if they are not so rapid. There is great
want of observation in this remark, for ex-
actly the body be in a different position



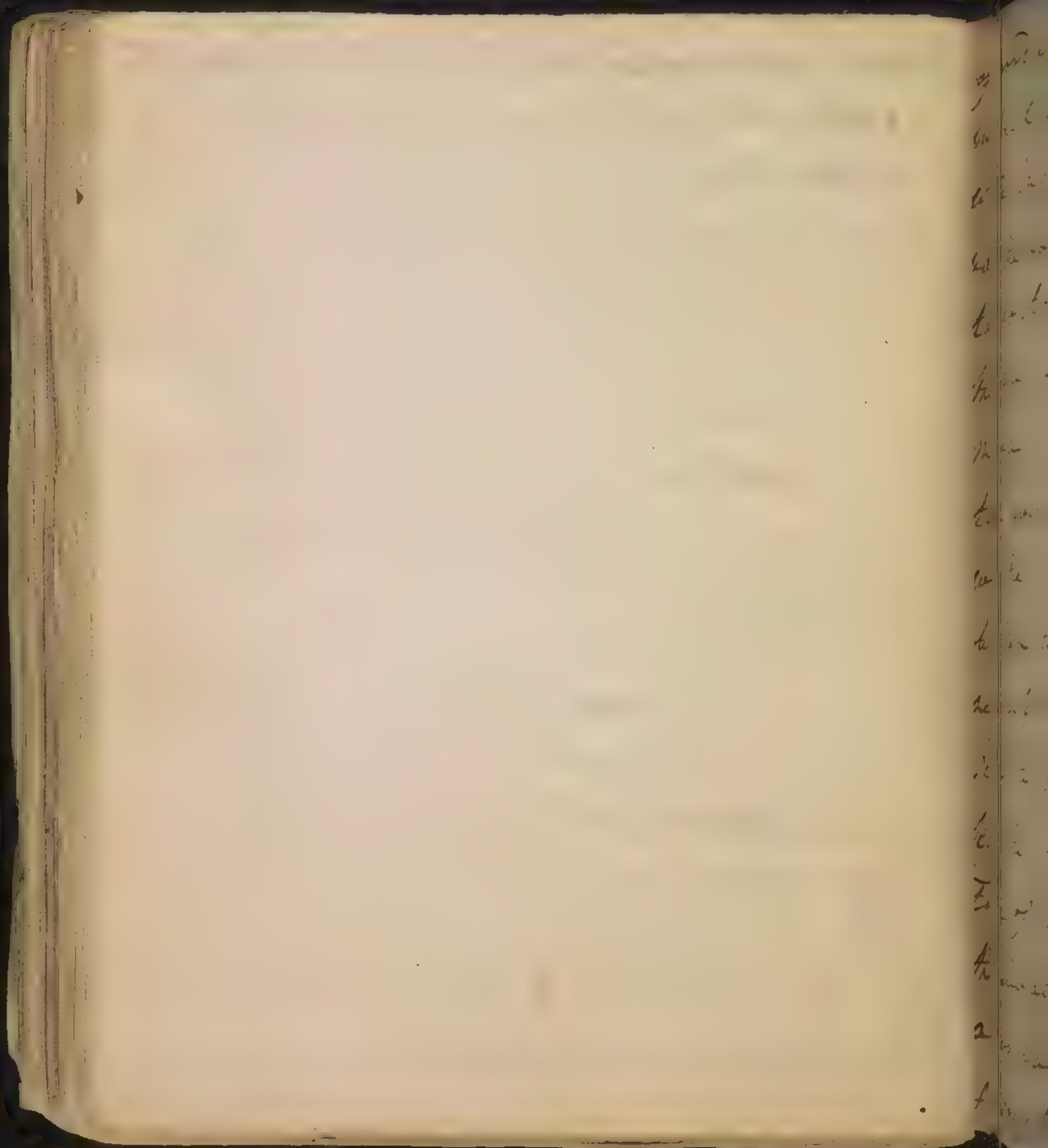
from that they always assume when 41.
they first attempt to swim, no other than
this violent exertion will support them,
Before therefore they are able to be up impe-
tuous they should be directed to raise the
hips to the horizontal line, for then alone
when the broad part of the body is pressing
on the water will a moderate action
of the arms and legs suffice. For with
the back convex and the feet dependant
or with an approximation to the posture
of the diving water, the motion must be
violent, as the best swimmers exhibit, in
the forcible impulses they are obliged to make
in the water to support themselves for a short
time in this upright position -

After the boy has made many unsuc-
cessful attempts to support himself by this

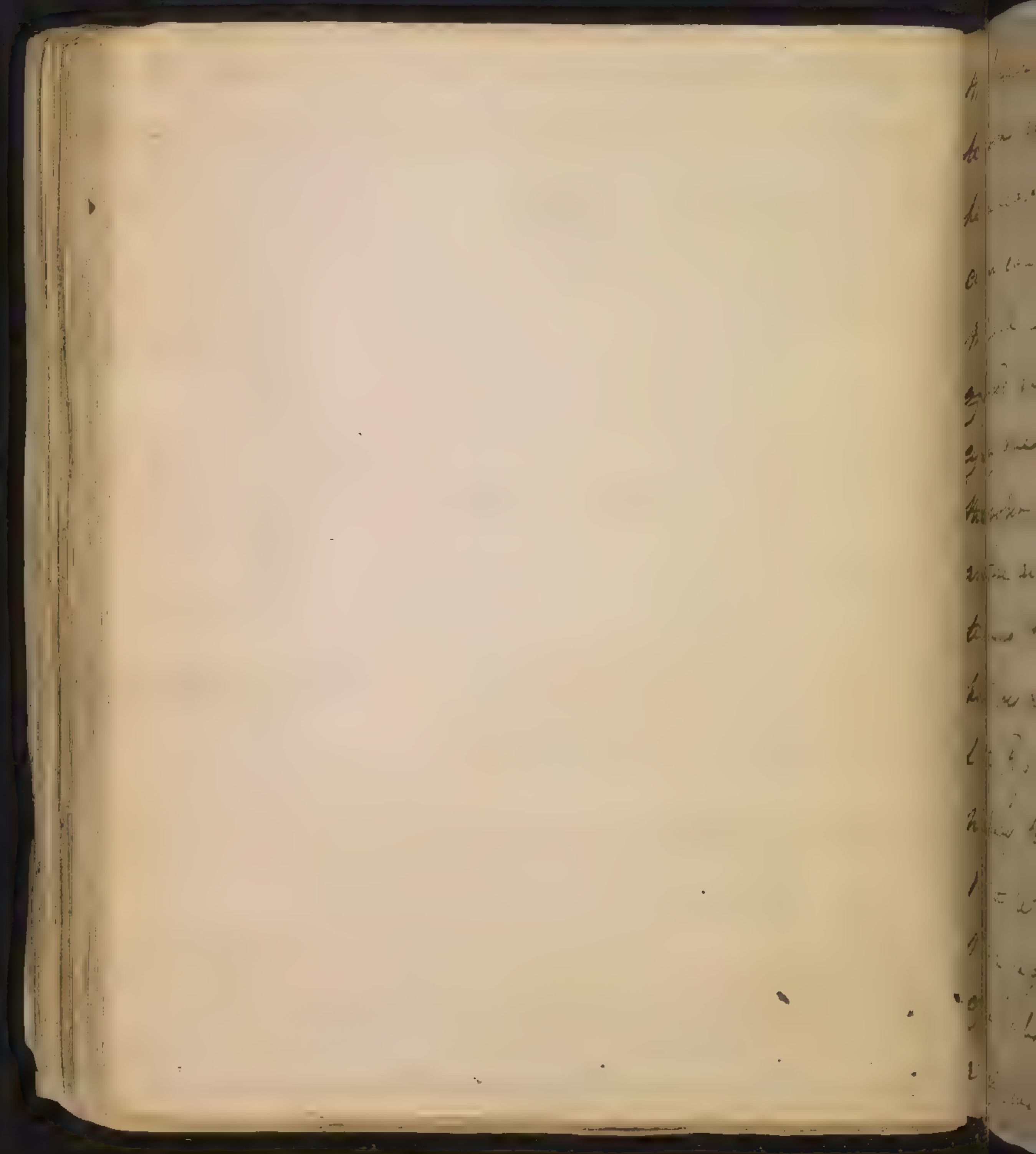


violent exercise of his limbs, he finds 42
by accident or design, that the more he
elevates the hips to the surface by straightening
the back, the more easy the support becomes
and the more progress he is able to make thro
the water, till at last he attains a complete
dominion over that muscular management
which elevates the body to the horizontal pos-
ition, and then and not till then he becomes
a swimmer.

Boys in learning sometimes make use of light
substances as bladder, cork, and a piece of wood.
The bladder and cork are usually placed
about the chest and by their buoyancy prevent
the body from sinking even in the upright
position. But these are generally slow aids
as they do not teach the essential art of
elevating the back. The use of a long
piece



of wood is better. For the boy laying 43.
his breast upon it whilst it extends his
whole length, the lightness of the wood ele-
vates the head, hips and legs to the horizon-
tal position, and teaches him to retain
the same situation when the wood is re-
moved. The teachers of the art generally
take him into the water, and support them
with the hand under the body, they then
tell them to strike the hands and feet
regularly. The great aim of this mode
seems to be to teach the art of ma-
king the regular stroke. But the advan-
tage of the mode really consists in
the elevation of the back, so that after
a boy has been held in that position
for some time by his master, he associates



44.
This horizontal posture with his attempts
to swim, and when the hand is removed
he endeavors to preserve it by the mus-
cular contraction of the back. Thus
the hand under the body and the piece
of wood are not of service from the buoyan-
cy they give, but because they direct to
the proper and indispensable posture. Nor
are these aids of much consequence in
teaching the stroke, as the support of the
body does not much depend on its regu-
larity. Regularity of stroke is absolutely
necessary to rapid progressive motion.
But it betrays want of observation, to say
that a regular and synchronous action
of the limbs is a necessary preface to the
art of swimming, since we see in good

[illegible]

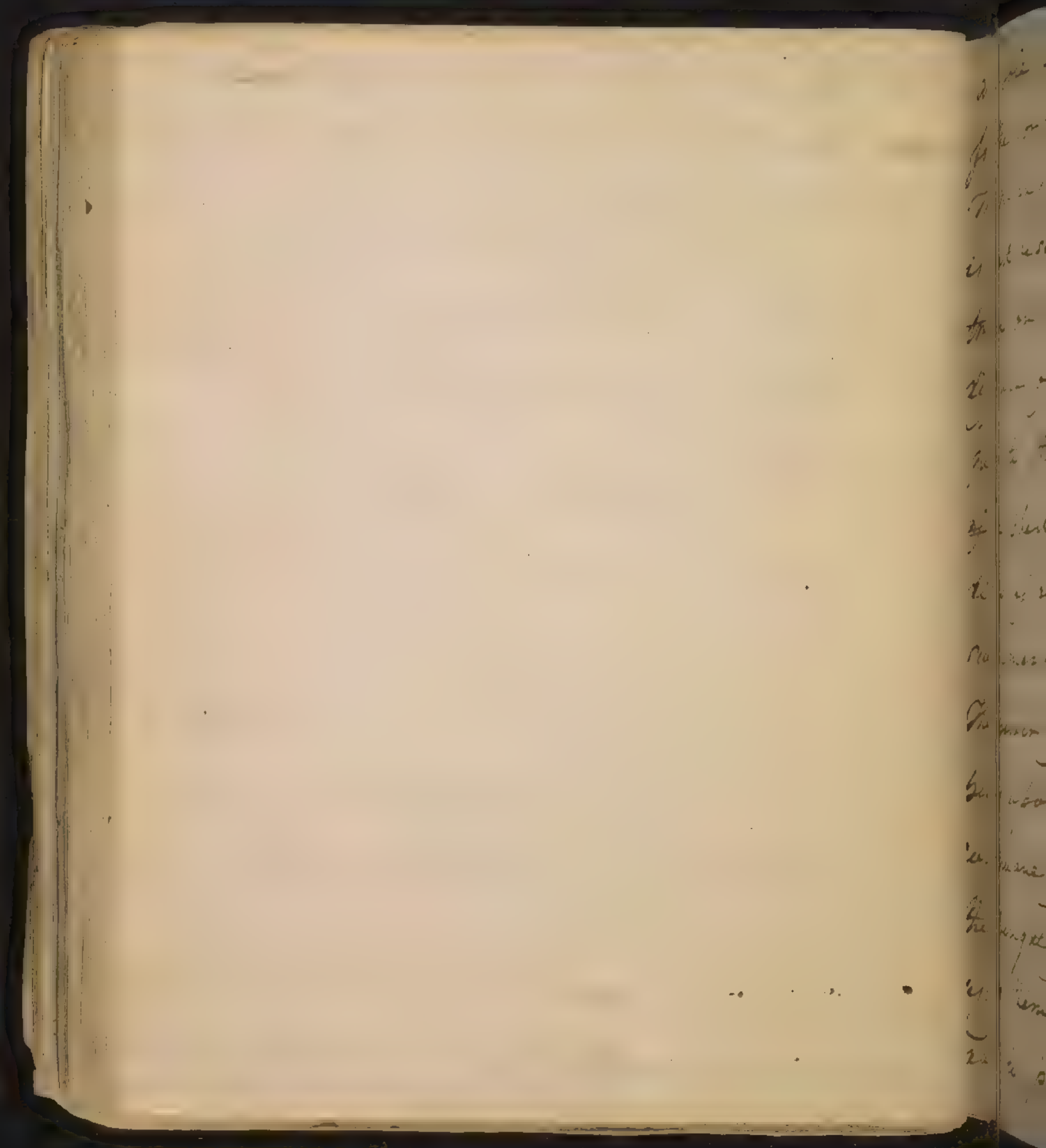
45
Swimmers who are masters of the
great essential for the art, the flat po-
sition, can support themselves with the
most irregular motion of the limbs. And
those postures they go through for the dis-
play of feats of dexterity, are made by
a wide departure from that parallelism
and regularity of stroke which are sup-
posed so necessary for the acquirement
of the art.

The art of swimming on the back and
floating are acquired also by learning
to bring the body horizontally to the sur-
face. If we observe a boy attempting
to swim on the back or float, we
see he is not master of this art of pre-
serving the body along the surface, for

[illegible]

As he pushes the feet above ~~the~~^{it} ~~the~~ 40
~~feet~~, the hips remain sunk and the
body curved, and as in this curved
posture he has less extent to oppose to
his ascent in the water, he can main-
tain that floating posture but for a
very short time.

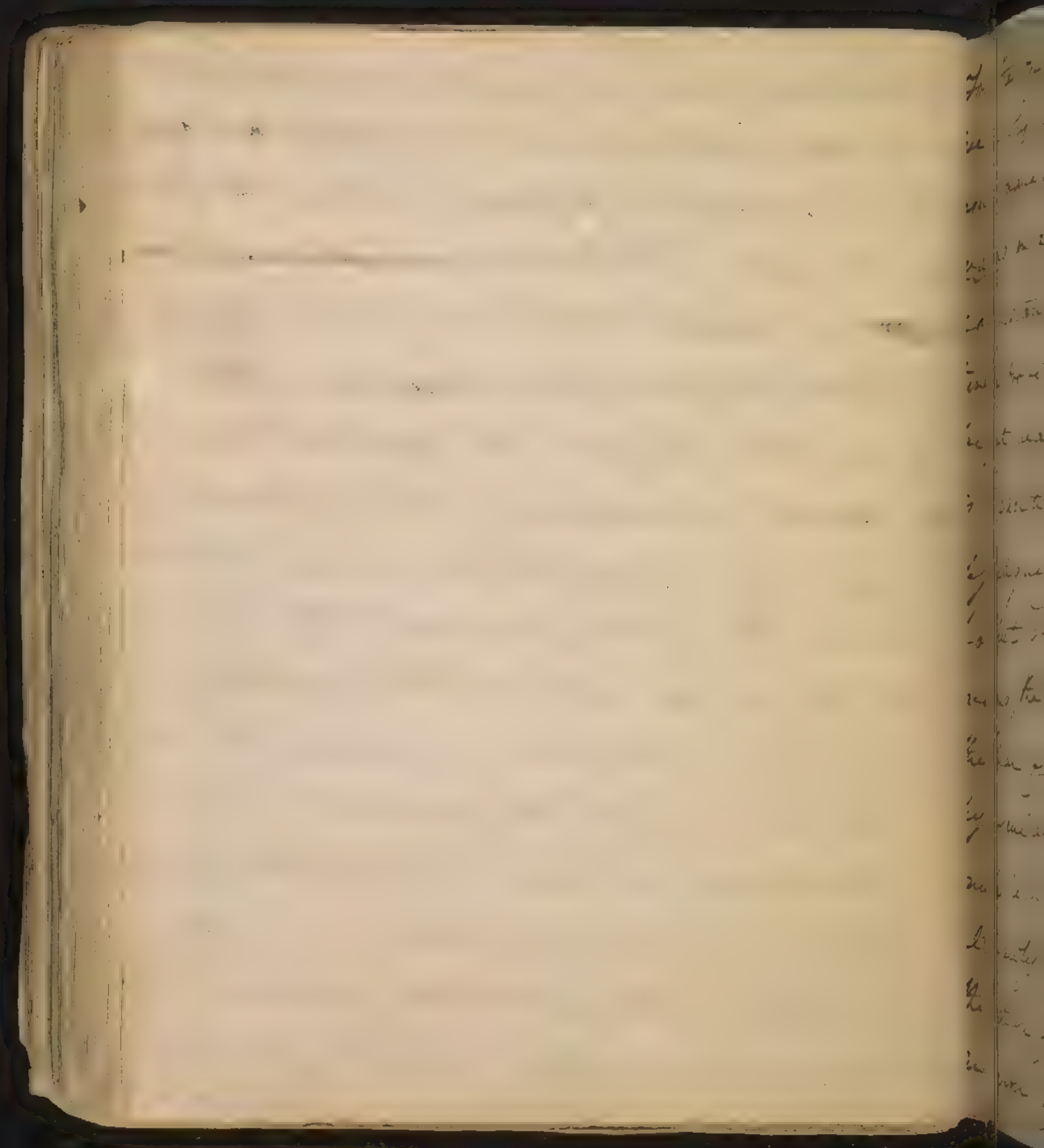
From the principles which have been
laid down we may easily point out
by what means swimming may be most
rapidly made and longest borne without
fatigue. - The first requisite for rapid swim-
ming is Buoyancy, for when the body is
easily supported, less muscular exertion is
required for that purpose and more can
be given for its progressive movement.
The requisite in structure is a broad palm



and sole, and great muscular power 47.
for the forcible exercise of these. -
The means in position is that in which there
is least resistance which is when the body is
thrown on one side in its progress, for the
difference of resistance will be then just e-
qual to the difference of breadth and depth
of the chest. - and I am told that the Sw
dishes of our country who are expert
swimmers, use the side method habitually.
The power of swimming a long time, de
pends upon the same principles as the long
continuance of any other muscular exertion
the strength of muscles and the habit of
using them. Some men from habit are
able to perform great exertions in this
way.

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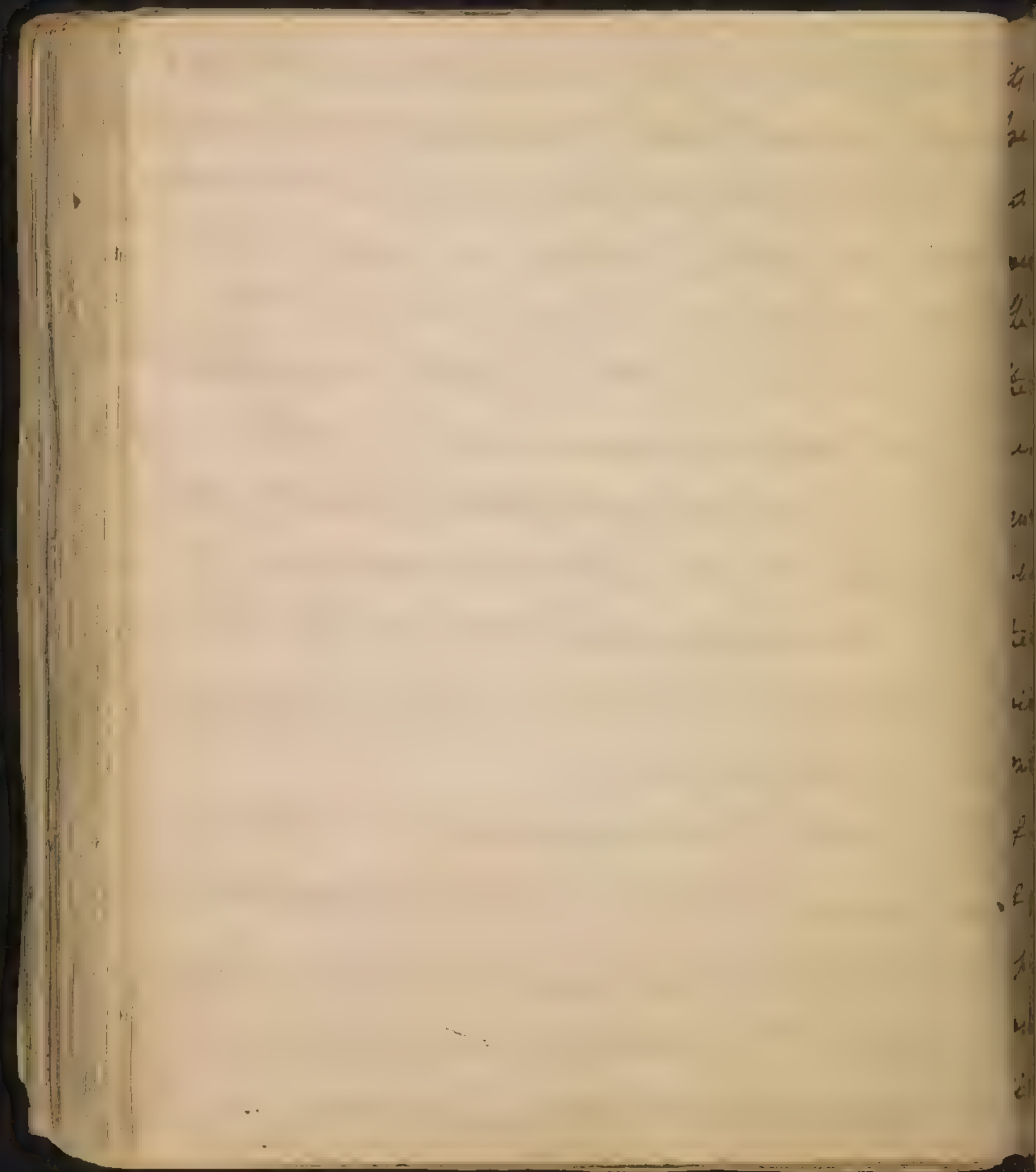
D^r. Franklin when a youth drew con 48
several notices in London from an ex-
hibit in swimming from Chelsea to Black
friars bridge, a distance ~~as with as I~~
~~at least~~ of about three miles. and Baron
Amielot relates that there are men
in Peru who perform the duty of the
letter post by swimming down their
rivers for a journey of two days, resting
occasionally in their course. They use a
small log as an aid in their support, and
carry the letters bound in a turban about
their heads. - Capt. King during his stay
at the Sandwich islands saw a child of
only four years of age, that had been
accidentally over set in the sea, swim about
with the greatest dexterity till it regained
the boat.



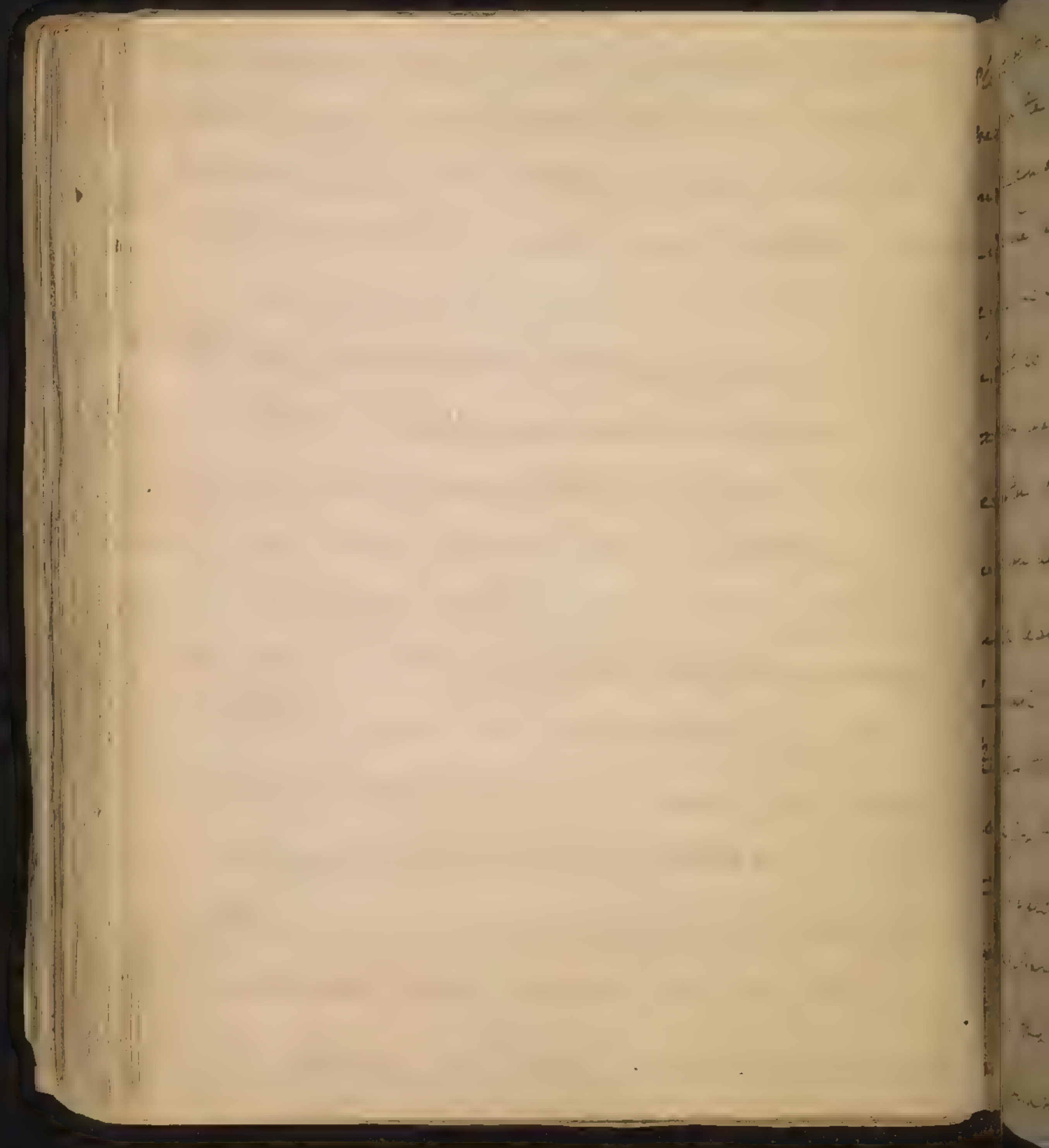
From the motions necessary in swimming, we see why that exercise is so tiresome. The usual movement of man on the earth is walking. In this we see one of the abundant instances of the wise economy of nature in providing for the most necessary and frequent wants of animals. For so small is the exertion of walking that it is much less fatiguing than standing equally on both feet for the same length of time. In walking, the ^{most of} weight of the body is borne by the pillar of bone of the limb and a very little by muscular exertion. The only action of the muscles being the tilting the centre of gravity alternately on the advanced legs. But the action of the limbs in the water is a succession of leaps, in which the whole

weight of the body is propelled by the 50
muscles. whereas such is the contrivance of
the art of walking that not a fourth part
of that weight is moved or supported by
them, the remainder being upheld by the
pillar of bone. — The exertion of the arms
two which are employed in removing the we-
ter at a great distance from the centre of
motion at the shoulders, the exertion of
keeping the body horizontal and the labour
in supporting the head, are all attended
with great fatigue.

Dr Franklin has concluded his little prac-
tical essay on swimming by saying it is
"an art which when once acquired is never
forgotten," This is uttered with a kind of
at home the point, that would seem to
himself



its truth with some triumph to this 50
peculiar art. But there are many other
arts that are never forgotten tho' learn'd with
greater difficulty and in much longer time.
The power of memory in any art depends on
the number, complexity and rapidity of motion
necessary for its execution. If the motions be
numerous or complex, the power of the memory
over many parts of the process will be lost from
the weight of the burden, if the art require ra-
pid movements, the ability for them must be
preserved by continual exercise - The art
of playing on musical instruments, and some
of the manufacturing arts which have been
aptly term'd the arts of handling are often for-
gotten in the particulars of their austere
detail, since the vast number and manual



51
slight of motion they require is too
great for the memory, But the more general
and leading practice of these arts when once
learned are retained for ever. - If swimming
requires such intricate and almost infinite
movements as musical performance, the skillful
execution would like that after an intermission
be forgotten. But if the theory of swimming
given to you be correct, the memory is only re-
quired to hear this simple precept, that the
back must be elevated to the surface of
the water. This may and surely will be re-
tained for the longest life. And as the mo-
tions for effecting this horizontal position are
not necessarily rapid there is no need of
constant practice to preserve distinctly. The
art of swimming then is not forgotten only



because there is little to be remembered. 52
I have never heard that the art of Skating
is forgotten and yet the unaccustomed mo-
tions and management of the body for
this exercise are more numerous than for
swimming. As in it there is a necessity for
a rigidity of muscles to preserve the position
but there is besides a necessity to attain the re-
collection of the variations of the centre of gra-
vity, the most delicate perhaps of our bodily
perceptions, yet when this art is once acqui-
red the knowledge of it is indelibly band-
ed on the memory. —

I have thus gentlemen made an effort to exhibit to
you some leading views of the theory and art
~~practice~~ of swimming. If I cannot call it an
important subject for your consideration. I

Amans..

"Necit nec litteras nec natane."

at least believe it to be the most popular⁵³
and practical
that could be selected from the whole com-
pote of Physiology, since every man has some
interest in it. The ancients, whose political
institutions incited and required the prac-
tice of Athletic arts, used to say in contemp-
tuous reproach of the neglective education
of any one that "he knew neither his letters
nor how to swim." The Campus Martius at
Rome was chosen on the borders of the Tiber
that the school and sports of the field and
water might be united and relief afforded
to the rust and fever of their daily drill. Some-
times do not command the necessity of an
education in this art, and tho' it may be ques-
tioned whether the rare occasions which occur
of preserving life by it, should make it an
impossible part of instruction, more than

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many other arts of equal utility which 54
are not universally taught. Yet it becomes
an object of interest and curiosity to all, ^{from} the at-
tempt that one universally made either through
usefulness or pleasure to acquire it.

It is a triumph of modern science which
the ancients neither effected or gained, that
the intellectual efforts of philosophers have been
turned to those practical labours that benefit
the moral the political and physical sta-
tion of man. The intellectual industry of
antiquity was wasted in the vanity of its
pursuit; and the sciences of its literature, its
abstract sciences and elegant arts, must
aplace the loss the world has sustained, from
the multiplicity of much of its philosophical
labour. We look with wonder on a
people

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who could confuse its Religion with Mysti⁵⁵
scism, and deform its science by the enquiry
after first and unsearchable causes, and at the
same time with flagrant inconsistency refer
to a confession of the want of Christianity, and
approximate to the sublime inventions of Leibnitz
and of Newton.

This neglect of the highest aim of science its practical
application, was not the result of its necessary progress
tho' the early steps of imbecility, since Archimides e:
equally skilled in theoretic and practical knowledge has
left his opinion that the practical and mechanical
views of science were beneath the mind, and that the
retic and abstract pursuits were the godlike employment
of man. And whilst he has given to posterity whole books
on the properties of Curves he has made no mention of
those wonderful arts by which he preserved his Country
from all the attacks of a skilful and powerful enemy.
He paid a fatal tribute to his abstract partialities
a type to the world of the fatality that must

await the scientific pursuits of man in a
universal reliance on this belief — — —

James Rush

Philadelphia

October 1815

ins

Handwritten text in a cursive script, likely a signature or a note, running vertically along the right edge of the page.

